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By: James Pomeroy

The booming digital economy

The pandemic accelerates the megatrend

COVID-19 has accelerated the shift towards a more digital economy…

…forcing changes in habits that are likely to persist…

…with huge implications for governments and policymakers

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Executive Summary

We can all feel the world around us getting more digital. You could be reading this on a hand-held digital device; you might have bought something online recently; and you will almost certainly have used a digital channel for news, music or photo-sharing in the past 24 hours.

We believe this is just the start of the digital economy, and thanks to many underlying forces pushed further by COVID-19, it is only going to get bigger in the years ahead.

The pandemic has caused a re-think in how the world thinks about digital technology. It's allowed us to work remotely, shop for groceries and essentials and stay in touch with family in ways that we hadn't quite realised previously. To say you were going to 'Zoom' someone back in 2019 would have sounded crazy.

The crisis is speeding up what was already happening. As we wrote in both *The rise of the digital natives* (back in September 2017) and *The disrupted economy* (in February 2019), the role of digital consumption in the global economy has been rising. And it was expected to keep rising, driven by gradual shifts in consumer tastes, demographic change and the development of new technologies. Indeed, over the next decade, the share of consumers who are digital natives was predicted to double across the world, meaning more consumers willing to use more digital technologies and more open to adopting new tech.

Now things could move even faster. Think of the behavioural changes caused by the pandemic. Parents will have used social media or video calls to keep in touch with their children. Office staff will have worked from home. And with physical stores closed, people of all ages will have bought items online – from clothes and toiletries to beer, and from paint to cutlery. Many of these behavioural switches may be permanent.

If they are, governments around the world will need to invest in digital infrastructure and upgrade existing systems. And this will need to happen anyway in countries where people find it hard to work remotely or shop online due to a paucity of digital devices or slow internet speeds.

Of course, some of these changes will be reversed – and there are signs that some of our digital switching has cooled in the past few months with 'zoom fatigue' and missing in-person interaction – but usage of digital services is still far more elevated than it was before COVID-19.

Taken together this means that ever more consumption is going to go digital. We estimate that roughly 50% of goods consumption *could* easily be made online in many developed markets by 2030. The UK pointed the way ahead at the peak of the pandemic, when a third of retail sales were online. How close we get to the 50% number will vary by country, and while it does imply a big change in consumer habits, it is worth remembering that a decade ago we used to buy flights in shops. A lot can change in ten years.

On the production side, we expect more businesses to invest in automation in the coming years − both to save costs and to make social distancing easier. The falling cost of industrial and service robots means that we could see the number of industrial robots rise fourfold by 2030.

The huge stock market outperformance of the US tech giants in 2020 is likely reflecting a view that the pandemic has transformed the prospects of the digital economy over the long term.

All of this could cause significant disruption to lifestyles and have huge economic implications: some positive, some negative, and some that are unclear. Potential changes include:

- **Remote working becomes the norm, and flexible working may follow**. The pandemic has allowed millions of service sector employees to work remotely and flexibly. We expect the trend to continue even when the pandemic is over, even if people only work at home part-time. This could be the first step to truly flexible working, which could add to productivity. Shorter working weeks are possible if this becomes the case.
- **Leisure time will increase**. With less time wasted commuting, we will have more time to spend with our friends and family or to consume entertainment, if incomes permit. This may not be physical leisure activities – content consumption will likely keep increasing too. This multi-decade trend has been interrupted by the pandemic, but a more digital economy will push leisure even further.
- **Banking penetration could rise**. Governments, central banks, businesses and households have all turned their backs on cash payments during the pandemic. Ultimately this may lead to faster adoption of bank accounts and mobile money in many parts of the world.
- **Inflation may come under pressure**. While much of the short-term debate on inflation focuses on the trade-off between supply chain disruption and the unprecedented drop in demand, further out a more digital economy should lower costs for businesses and improve price transparency, pushing inflation lower than it otherwise would be for a given set of economic conditions.
- **Measuring the economy may be harder**. Some digital transactions are harder to track than physical ones in traditional economic data, particularly in real time. And as goods become services (think about fewer CDs and more streaming) we could see a natural drag to industrial production and goods trade data – making them less valuable measures of activity. A shift to a broader set of data may be needed to track activity in real time, and GDP data may be more prone to revisions.
- **Jobs could be at risk from automation.** While some jobs will be created as tech companies expand and new companies spring up, wage growth will likely be lower for low-skill workers.

All of this will create more challenges for policymakers. Central bankers will have to contend with an economy that is harder to track in real time and inflation rates that are lower than they otherwise would be.

For governments and society more broadly, the risk is that inequality widens, particularly if wages and employment levels for low-skill jobs are hit hard. We could see policies such as universal basic income or job guarantees becoming more widely discussed. We could see higher taxes on tech companies, which in turn could lead to more international disputes. And governments will have to be more alert to data security and cybercrime. This could either lead us down the route of more international cooperation − or to increased tensions − depending on how things progress.

Finally, we look at which technologies can make this all possible. Getting the world connected will require innovative developments such as low-orbit satellites. Virtual reality can change the way we think about work and leisure, particularly as headsets improve and drop in price. Further developments in AI and robotics could mean more jobs being automated, allowing businesses to save costs but adding to personal insecurity. See page 37 for all of the details.

This report shows how the digital economy has accelerated as a result of the COVID-19 pandemic. We aim to delve into more detail on certain topics in subsequent notes.

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Digital economy snapshot

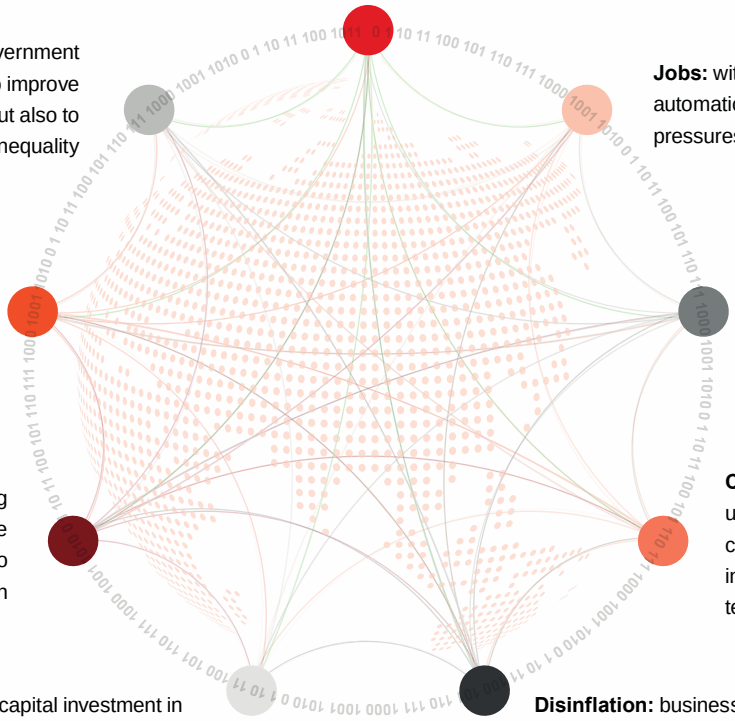
Key components of the digital economy

A new economy: a bigger digital economy will drive substantial macro changes from new jobs, new consumption patterns and policy changes

Policy challenges: greater government investment needed not only to improve access to digital technologies, but also to tackle rising inequality

Jobs: with more businesses investing in automation as a result of COVID-19, pressures on jobs will no doubt intensify

Measurement challenges: capturing the true level of economic activity will become more difficult as we move away from physical to digital transactions



Remote working: will have a substantial impact on cities if people end up working from home 2-3 days a week

Spending patterns: spending on leisure will strengthen as time is saved on daily tasks thanks to technological innovation

Cashless payments: cash usage has dropped in many countries with businesses investing in contactless payment technology

Investment in tech: capital investment in the coming years will focus on improving connectivity, automation and similar areas

Disinflation: businesses face increasing pressures from competition, productivity and lower prices for the consumer

Key facts and figures

50%
of goods consumption could be made online in many developed markets by 2030

48%
of point-of-sale payments in mainland China being made using mobile wallets in 2019 (21.5% globally)

40.2%
of consumers globally will be those who have grown up as digital natives by 2030

14%
of the global workforce will change occupational category as a result of AI, robotics, and automation by 2030

Technologies that make it all possible

Virtual reality | **Low orbit satellites** | **Automation**

ESG factors

Higher income inequality | **Data concerns** | **Greater power demands**

Source: World Economic Forum 16 December, HSBC estimates using UN population division data, WorldPay payments report 2019, HSBC

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How digital could the economy get?

- COVID-19 has accelerated the shift towards a more digital economy…
- …with forced habit changes that may not be reversed…
- …meaning that digital consumption should keep rising from here

What is the digital economy?

The digital economy is hard to define, partly because it is always evolving and encapsulating more and more things – such as e-commerce, digital services and computer hardware and software.

The global economy is becoming more connected

All of these components will have different impacts on the economy, but are all driven by increased connectivity. We've seen internet adoption rates continue to rise across the world and access to cheap hardware has meant that more people have access to a smartphone than ever before.

The pandemic has changed the way we think about digital technology, and has changed many assumptions on how big the digital economy could become and how quickly it could get there. We believe that there are four main factors driving the growth of the digital economy – two that have changed as a result of the pandemic and two which support the underlying trend.

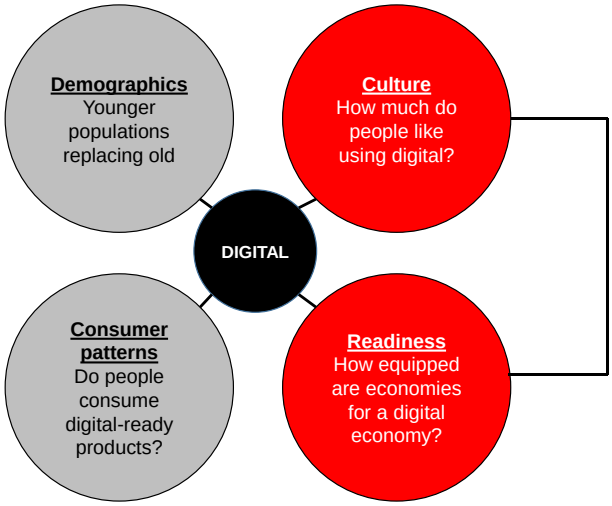
1. Consumer patterns
COVID-19 has encouraged or forced many people to re-think how we consume. Many people have gone online for things for the first time. The steady rise in digital consumption is likely to continue in the coming years.

2. Technological readiness
Governments that provide a platform for the digital economy to grow will clearly see the biggest impact. Investment in internet connectivity, speeds and digital infrastructure is likely to accelerate as a result of COVID-19, with countries that can shift online more easily seeing a smaller impact on output and employment.

3. Culture and habits
Many countries have a culture that means new technologies are adopted there sooner than in other parts of the world, with northern Europe and east Asia the leaders here.

4. Demographics
Young people use more digital goods and services than older generations – and as populations evolve, this cohort effect will push up aggregate usage of all forms of digital technology.

1. What drives the digital economy?


Demographics
Younger populations replacing old
Culture
How much do people like using digital?
DIGITAL
Consumer patterns
Do people consume digital-ready products?
Readiness
How equipped are economies for a digital economy?
Changes as a result of COVID-19, due to:
1. Habitual change
2. Businesses prepping for online
3. Social distance desires
4. Survivorship of more digital firms

Source: HSBC

In the rest of this section, we explore each of these drivers in more detail, to show where the digital economy is likely to grow more quickly and how big it could get.

Changing habits

The COVID-19 pandemic has accelerated many trends, with consumer behaviour being diverted away from physical goods and services as a result of lockdowns, social distancing and changes in living habits. Eating food at home has replaced eating out and leisure activities have become home-based, with people watching Netflix, making banana bread and taking part in online quizzes rather than going out to bars, cafes and leisure facilities.

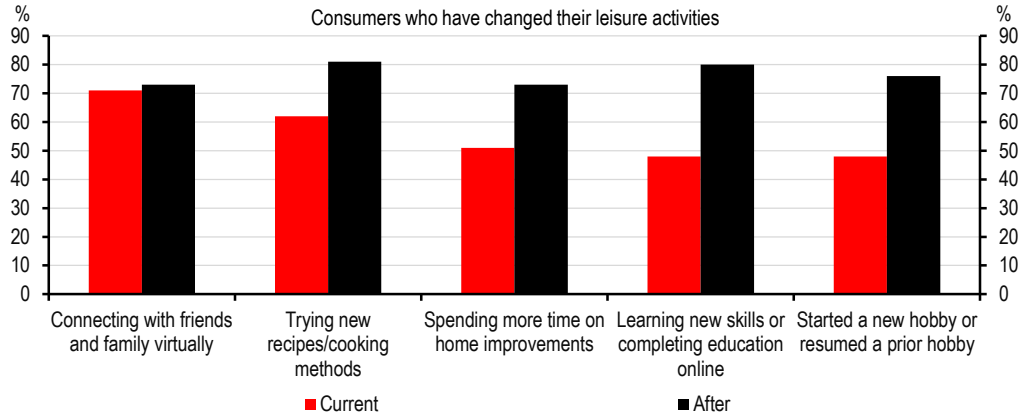
Habits get entrenched

It only takes 66 days for habits to be formed

According to a study by Philippa Lally et al[1], on average, it takes more than 2 months before a new behaviour becomes automatic — 66 days to be exact. This varies widely depending on the behaviour, the person, and the circumstances, but studies such as those surrounding London underground strikes[2] suggest that when people are forced into change they often don't change back easily – particularly when they discover the previous habit was suboptimal. This is likely to be the case with digital and online consumption. While many people would never have considered buying some items online before lockdowns, enforced behavioural changes may be hard to reverse – so those online purchases of coffee beans, beer, toothbrush heads or shampoo may well continue. This isn't just limited to online shopping: consumer surveys suggest that leisure activities (chart 2) may also shift permanently as a result of the pandemic.

[1] Lally, P., Jaarsveld, C.H.M., Potts, W.W., Wardle, J. How are habits formed: Modelling habit formation in the real world, European Journal of Social Psychology, July 2009.
[2] Such as: Larcom, S., Rauch, F. & Willems, T., The Benefits of Forced Experimentation: Striking Evidence from the London Underground Network, Oxford University, May 16, 2017

2. People's leisure habits are changing too



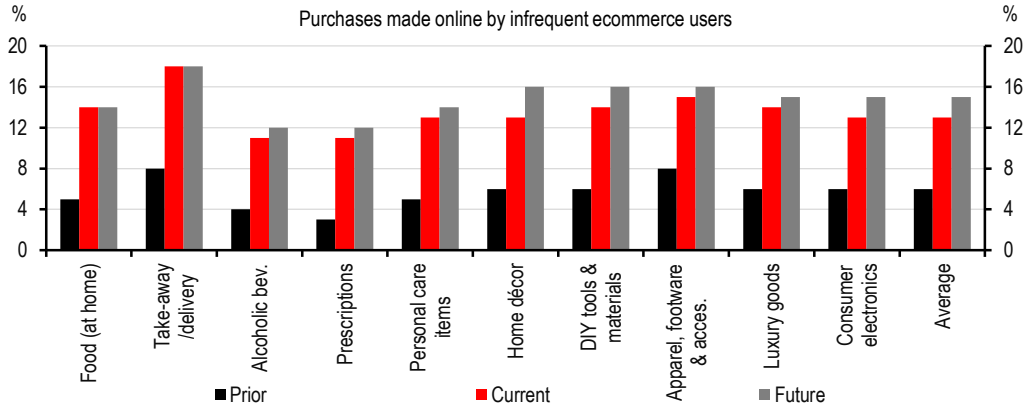
Source: Accenture, Survey from April 2020

More people are online shoppers

More people are shopping online

Data from Accenture (chart 3) suggests that those who were previously relatively infrequent online shoppers have seen their online spending pick up during this crisis, and they expect the amount of online spending to be even higher going forwards across all categories.

3. Previously infrequent internet users are showing signs of habitual change



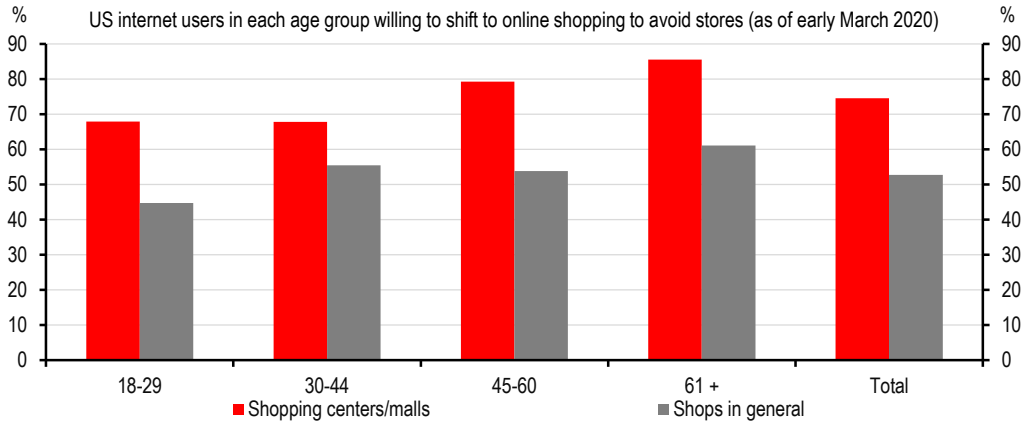
Source: Accenture, Survey from April 2020

While all generations have been forced to shift several activities online given they are confined to their homes, older generations have had to make more of a shift than younger generations.

While at the start of 2020 the idea of video calling family members or doing an online fitness workout would have been unthinkable for many people, needs must; and we've seen older generations catch up somewhat with millennials and Gen-Z as adoption rates have risen at a faster pace. While adoption rates for most technologies are still some way below younger cohorts, the gap has closed.

As a result of lockdowns and social distancing requirements, older consumers, more affected by COVID-19, have opted to shop online rather than visiting physical stores (chart 4).

4. Many older consumers have been willing to move online for safety reasons

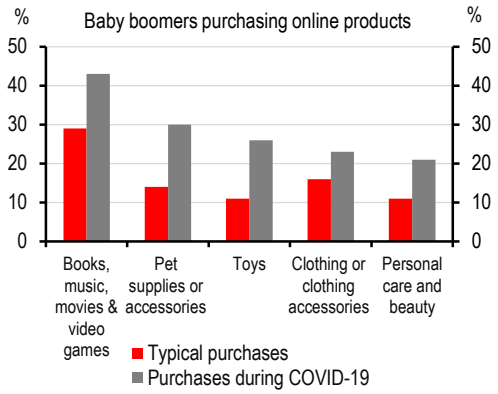


Source: eMarketer

A wider range of people are turning to digital services

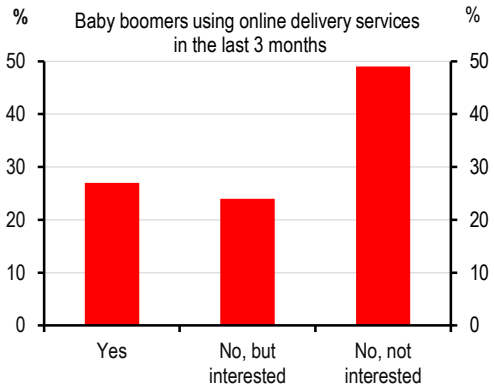
In terms of the numbers, 22% of baby boomers are shopping less in store and 8% more are shopping more online according to Contentserv[3]. Although these numbers appear small, these are people who have become online shoppers for the first time. According the US National Retailer Federation, 45% of baby boomers say they are shopping online more as a result of the pandemic, with 61% of respondents saying that they are using Amazon Prime Now, Shipt or Instacart more than before the pandemic. And spending has increased greatly in some categories (chart 5) with the share of baby boomers buying toys, pet accessories or personal care products online having doubled.

5. More baby boomers are shopping online as a result of COVID-19



Source: US National Retail Federation.

6. But half are still not interested in online delivery



Source: US National Retail Federation

A clear shift online for new products

The same trends are visible in Asia. 51% of South Korean connected consumers bought food and beverages on their smartphone in March according to Euromonitor International's 2020 Digital Consumer Survey. We saw a similar spike in mainland China during the Lunar New Year period in February with Carrefour reporting a 600% year-on-year spike in vegetable deliveries and JD.com reporting a 215% y-o-y rise in online grocery sales over the holiday.

Euromonitor suggests that 50% of global consumers purchase food or beverages through a mobile app and that some portion of consumers will remain shopping for groceries online, even though

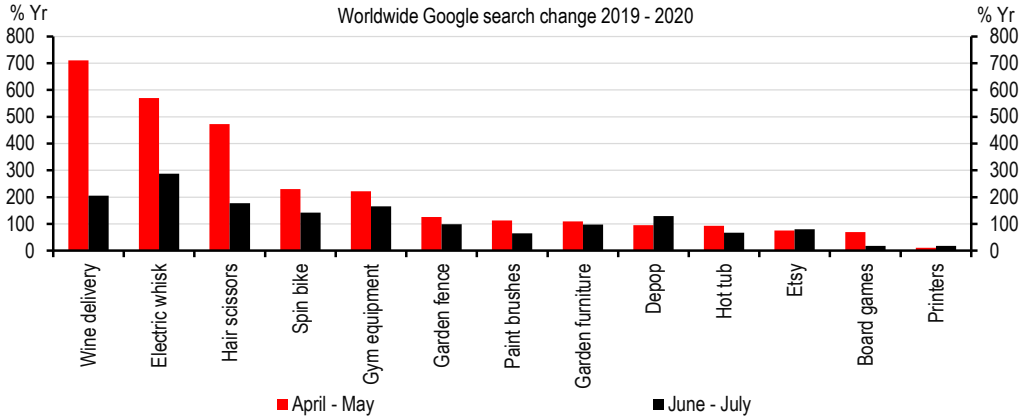
[3] COVID-19 is affecting everyone's shopping behavior differently, Contentserv, 2 April 2020

many will return to physical stores. We can see this shift in spending habits in the data with many products now being bought online rather than in stores.

Searches for some items have stayed high

Chart 7 shows the number of Google searches for certain products and how they've changed as a result of lockdown. We can see the items that spiked in search volume initially (such as 'hair scissors' and 'electric whisk'), but have since fallen away as they were one-offs, typically products needed to adjust to working from home or home gym equipment. But many semi-durable, more regular purchases have seen their demand persist. In the UK, the number of searches for "beer delivery" rose 30-fold during the peak of lockdown, and although the numbers have cooled as restrictions have eased and pubs have re-opened, the number of searches is still four times the number at the start of the year.

7. Some behavioural shifts may be sustained post COVID-19



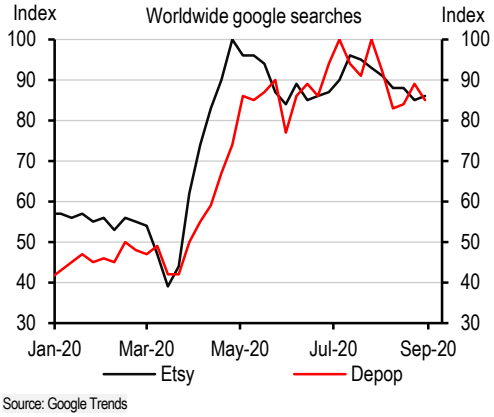
Source: Google Trends, HSBC

Resellers have seen a boom in demand

Retail sales data back this up too. There has been a clear shift in consumer spending away from services towards goods during this crisis, but many of the goods being purchased must have been online due to store closures. In the UK, searches for the marketplace Etsy peaked in July, rising throughout the pandemic. Shopify, the Canadian online marketplace, saw its sales double y-o-y through to Q2 2020 showing the scale of change that can happen.

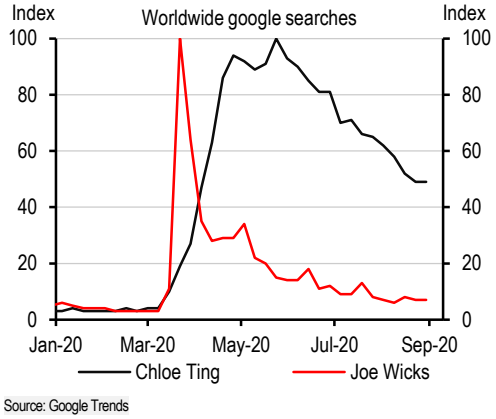
This enforced adoption of online consumption for items that may not have been bought online before means lower psychological barriers for buying them again. Now that it has been shown that Items such as paint, electric toothbrush heads and plants can be bought online, the trend is likely to continue.

8. Demand for resellers has stayed high…



Source: Google Trends

9. …but less so for home workouts



Source: Google Trends

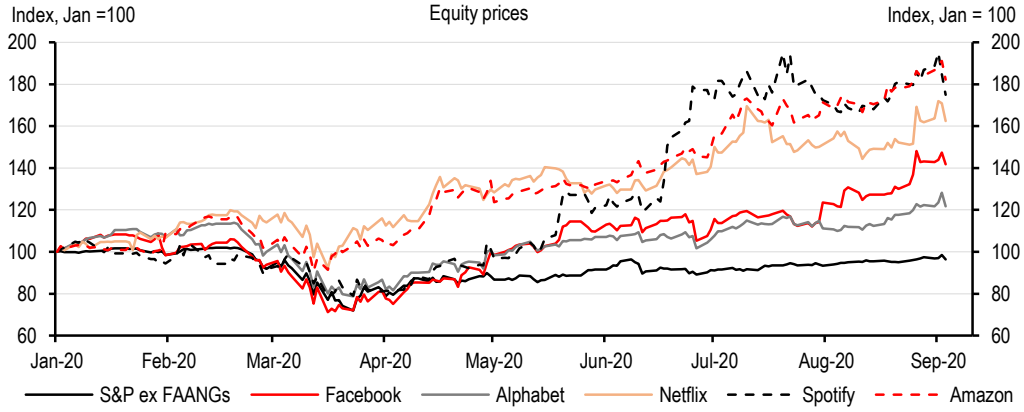
Entertainment: a different ball game

One of the biggest shifts has come in the entertainment industry. With cinemas, sporting events and concerts off limits to consumers, spending and eye-ball time has shifted elsewhere.

Digital entertainment has done well in 2020

Some of this has been easy to do. Netflix and Spotify have unsurprisingly been in enormous demand, but the shift to online entertainment has done wonders for the likes of Facebook (who own Instagram and WhatsApp) and Alphabet, with more time spent online, with YouTube a clear winner. There is a clear correlation in the share price movements – shares in Netflix and Spotify are both up more than 50% through the lockdowns, while Facebook and Alphabet shares are up slightly less - as advertising revenues are hit more than consumer demand for products.

10. Tech stocks have done well in the crisis as demand for their products has risen



Source: Refinitiv Datastream. Note: Spotify shown on chart instead of Apple to show the rise in demand for digital services.

These large, established companies are the low-hanging fruit. The crisis has brought two other emerging entertainment technologies to the fore: gaming and virtual reality (VR). On the gaming front, we've seen demand for esports (competitive gaming) take off, largely in lieu of traditional sports being broadcast. As outlined in Esports: Why Esports requires a different perspective, 28 May 2020, the industry may be a challenging one for investors but it is clear that more people are spending time in front of esports games. The streaming website Twitch (owned by Amazon) has seen a sharp increase in traffic during lockdowns, and this has been largely sustained even as restrictions have been eased across the world.

Gaming remains a growth industry

Whether all of these new viewers remain watching remains to be seen, but the industry itself is likely to keep growing. As the number of global internet connections and internet speeds keep rising, more players are able to play and watch games online – creating a clear base for growth.

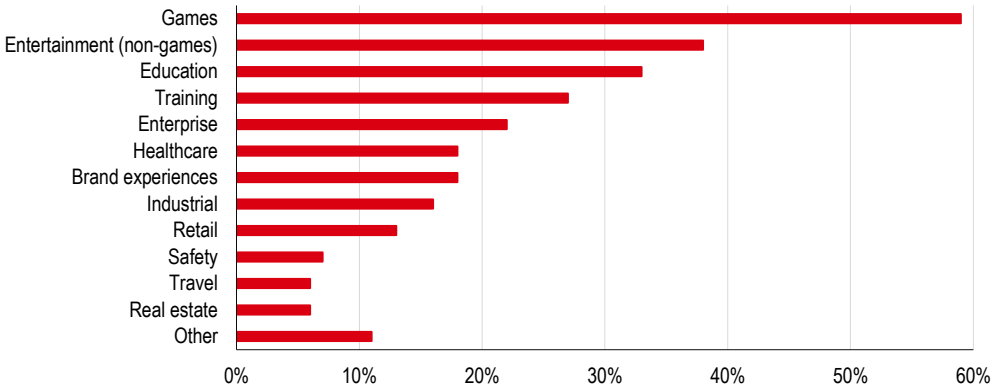
Virtual reality's time to shine

But esports is a relatively niche industry compared to what could be possible within virtual reality (VR). Already during the pandemic we've seen a range of new virtual entertainment options take off through immersive virtual reality and its sister technology 360 videos – from concerts, such as a high-profile ones from Jean-Michel Jarre[4] and Fatboy Slim to sporting fixtures, with the UK's BT Sport allowing viewers to watch football matches in 360, live from a mobile device. Given that mass events may be some of the last parts of the economy to return, virtual reality could have a lead time to encourage adoption that many other digital technologies don't have at this juncture. See "Beyond reality: the show must go on – can VR content make money today?" (20 July 2020).

4 The New Reality for Concerts in COVID: Virtual Reality?, Rolling Stone, 1 July 2020

The costs are still relatively prohibitive for many – a cheap headset can be picked up for USD20 (which uses your mobile phone) but for a truly immersive experience that gets close to replicating the 'real-world' version of entertainment events, headsets will set consumers back in the region of USD399. The cost of these headsets coming down sharply could easily lead to more widespread adoption, particularly if physical attendance at events is delayed even further into the future.

11. Gaming & entertainment (like concerts), education, training & enterprise is the target market of current projects in VR



Source: XRDC
NB. *Includes VR, AR and MR projects

Again, COVID-19 is accelerating an existing trend. Even if many people would rather enjoy the physical experience, football fans unable to travel to the team stadium due to geographical restrictions and would-be concert goers who don't have a local gig to attend or anyone wanting to have an immersive experience without leaving their home can benefit.

Do you need to travel?

VR technology is improving, getting more people using it

The improvements in VR technology could also mean that many other physical endeavours can become digital far more easily. While video-conferencing has become very repetitive for many during 2020, a virtual reality alternative could be far more engaging – meaning that conferences (such as 2,000 person VR conferences organised by the likes of Microsoft and HTC during the COVID-19 pandemic) could go virtual as well as one-on-one business meetings. Business travel volumes could fall dramatically over the medium term.

And the nature of leisure travel could be tilted slightly. Museums, such as Amsterdam's Van Gogh museum and Paris' Louvre have offered virtual tours of exhibits during their closure – and clearly there is likely to be longer-term demand for these services. Google arts and culture have partnered with 2,500 museums and galleries across the world to offer similar experiences. And in some cases, virtual tours can add something that physical ones can't: Niagara Falls State Park has arranged a virtual tour which can take visitors right up to the edge of the famous waterfalls.

Travelling without leaving the home?

Airbnb has added travel experiences on Zoom. The virtual version of the Airbnb Experiences offers activities such as baking, bike tours, Korean makeup tutorials, magic, hangout sessions with goats, fortune reading and meditation with Buddhist monks, by pairing customers with hosts from over 30 different countries, while zoos and aquariums have started live-streaming many animal areas.

While of course many aspects of travel cannot be replicated – the smells, the food and the people, some parts of leisure could have seen a permanent change as a result of the pandemic.

Feeling the burn at home

Given the closure of gyms, cancellation of amateur sports and social distancing restrictions – 2020 has seen a sharp rise in demand for home workouts, with the likes of Joe Wicks and Chloe Ting

keeping people fit all over the world. While demand for these activities is likely to wane slightly – again due to virtual fatigue – it is likely that many more people will use online workouts in one way or another in 2021 compared to 2019 as the door has been opened as to how easily these digital alternatives can be used.

Health

Seeing a doctor online is now more commonplace

Seeking health advice on the internet has become commonplace during the pandemic − and there has been a pick-up in virtual meetings with doctors and nurses. This may simply be because people have understandable concerns about visiting hospitals or GPs in the near term. But in the longer-term the trend might continue if it was felt to improve healthcare efficiency.

Even back in 2018, OECD data suggests that more than 60% of women in most northern European countries were using the internet to access health information – this could easily spread to other parts of the world.

All of these phenomena together show how quickly digital spending habits can take off and which ones could become more entrenched. But to see what share of consumer spending could be digital, we have to think about how much feasibly could go digital based on the spending mix by consumers.

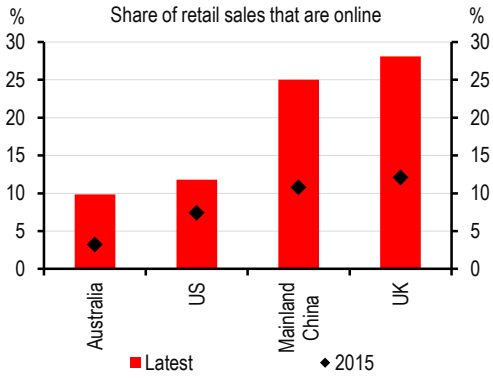
What share of spending can go digital?

It seems obvious to say that some products are much easier to consume digitally than others. For example, it's hard to consume a virtual hotel room but very easy to stream a movie rather than to go to the cinema.

Online sales are picking up quickly

Right now, across the world in most developed markets 10-30% of retail sales are online – with a clear divide between countries and categories. Online retail sales have risen far more quickly than physical sales during the pandemic, with most economies reporting data suggesting a double-digit rise in online sales over the past year.

12. Online retail sales are growing as a share…



Source: Refinitiv Datastream. Note: Mainland China data for H1 2020, others are for June/July 2020

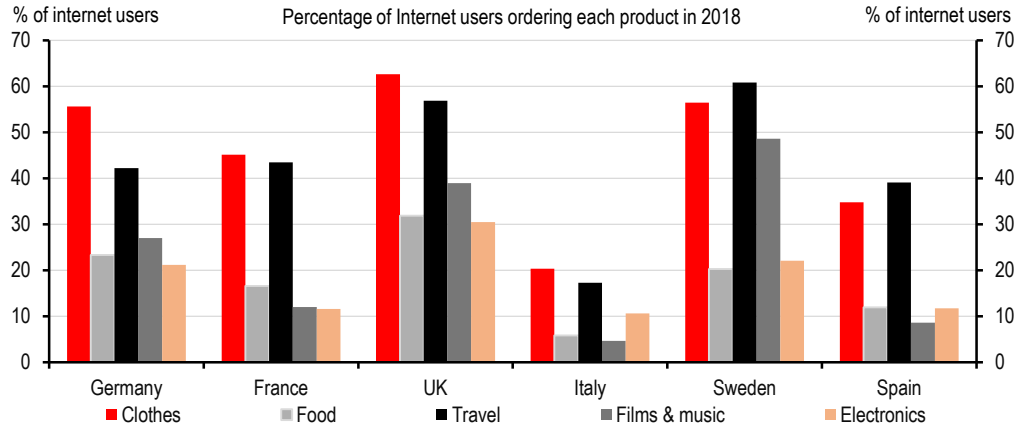
13. …and have accelerated greatly due to the pandemic

Source: Refinitiv Datastream. Note: All to July 2020 except for France and Italy (June 2020)

The UK was already the world leader in online shopping (as a share of retail sales) with 89% of consumers (based on Eurostat data) having shopped online at least once in 2018 and the share of retail sales being online rose to more than 30% during the lockdown, although this has cooled slightly as stores have re-opened. The equivalent figure was around 20% at the end of 2019, showing how easily an additional 10% of sales can move online. Elsewhere, online retail sales have been rising quickly in all the economies we have data for (chart 13), particularly Poland and Spain, from a low base.

Some products seem more appropriate to order online. Data from Eurostat show that in most large European countries clothes and travel are ordered online more than food, films and electronics. This will likely change over time as more digital options for consuming these products become available.

14. Consumers appear to be more willing to buy clothes and travel online



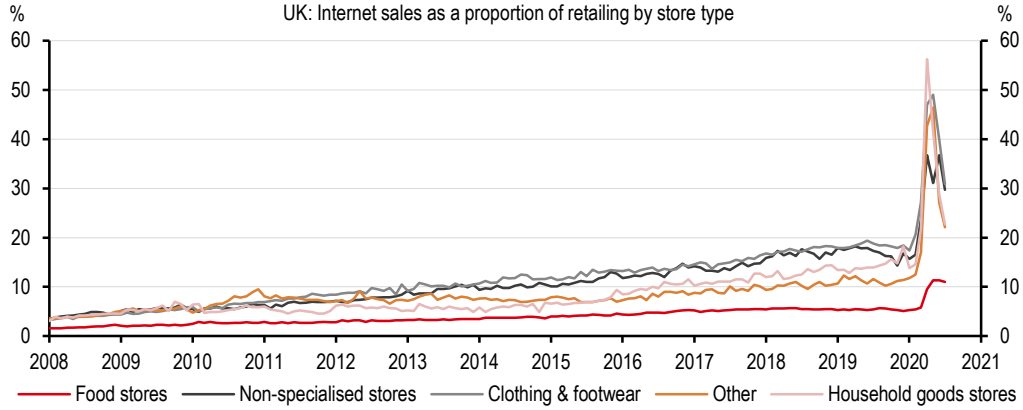
Source: Eurostat

In terms of what people buy online today, data from Euromonitor[5] show that store purchases dominate for the majority of items – but the share bought in-store is highest for food, household essentials and clothing. Some items, such as travel and leisure activities are disproportionately bought digitally, but eventually consumed physically. There is a clear distinction that needs to be made between something that is purchased digitally and consumed digitally, however.

A clear accelerant for many types of online consumption

We can break down the mix of spending currently to gauge how big digital spending could become in principle. In the UK, most categories, pre-COVID-19, were 15-20% online, whereas food retail was 7%. All categories have spiked dramatically as a result of the pandemic, while even food retail has doubled. Supermarkets remained open, meaning fewer reasons to shift away from physical shopping for many people, but many older customers have been anxious to avoid shops and retailers have become keener to supply groceries via online orders. See: UK Food Retail: New era creates new opportunity, 16 July 2020 for more details.

15. UK retail sales hit 50% online in some categories but have remained high even as stores have opened



Source: ONS

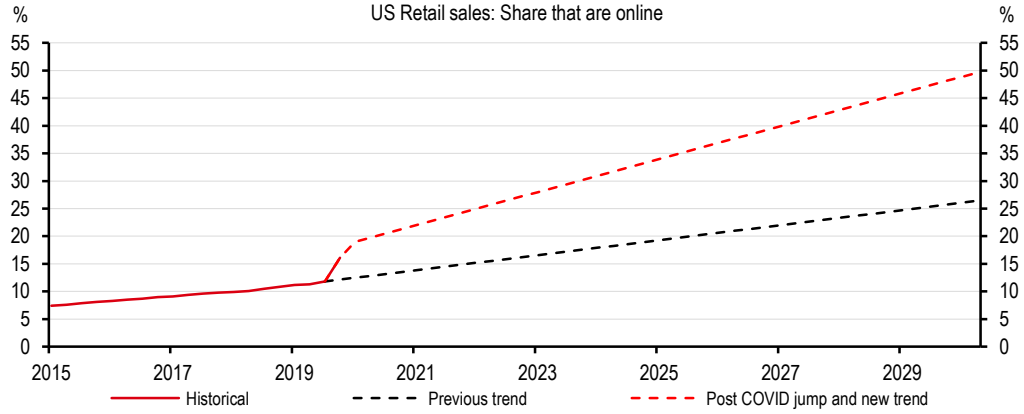
[5] Euromonitor, Digital Consumer Survey 2020: Key Insights, June 2020

We can use consumer spending breakdowns, such as US PCE, to come up with a rough 'back of the envelope' calculation as to what share of spending could, *in theory*, become digital. Giving each sub-sector a score of 0%, 25%, 50%, 75% or 100% based on our own estimates and historical shares such as those previously mentioned from Euromonitor or the UK's ONS.

Up to 50% of goods purchases could be made online by 2030

Summing all this up, we could see that it would be *possible* for roughly half of goods purchases to be made online by 2030. The US online retail market could be four times larger than it was at the start of 2020 if online consumption trends take hold. While these numbers may seem very high at first glance, it is worth remembering how quickly things can change: ten years ago it was still commonplace to buy a flight in a shop.

16. How much of retail sales could be online?



Source: HSBC estimates, Refinitiv Datastream

Services are a slightly different story, particularly as the split between what is purchased digitally compared to what is consumed digitally is hard to gauge accurately. Air travel, for example, is consumed entirely physically but a vast majority of payments of rent and mortgages are made digitally. For some services the story is more nuanced – car hire can now be done entirely through an app – or we can shift from phoning a local taxi company to finding a driver on an app. How we score these categories within the proportion that could go digital is clearly a matter for debate.

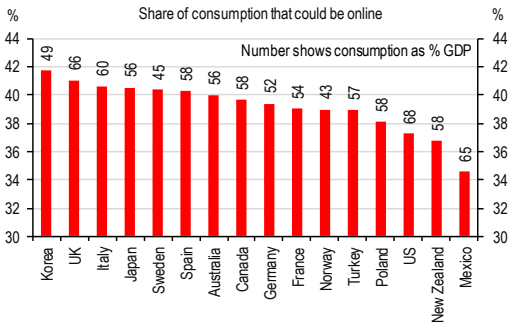
Digital services consumption should also rise

For the sake of this simple analysis, we have chosen to mark something that is purchased through an online platform as digital consumption – so paying a direct debit to a landlord or utility company isn't classified as such but purchasing a flight via a travel website is. Based on this, we estimate that roughly 10% of services consumption is digital today, which could rise to 33% by 2030, lifting total consumer spending on goods and services from 11% to 38% digital based on the current mix of spending in the US.

Across countries though, the mix of spending is quite different. Using the OECD consumption database, we can see how the different consumption mix shares across countries could affect the equivalent results across the world. This simple analysis suggests that in theory the share of consumption that could be largely digital could easily reach 40% in many places, meaning that digital consumption could amount to 20-25% of GDP in most OECD countries before too long.

17. At least 40% of consumption could easily be online in some countries

	How online?	Online share
Recreation & culture	**Low**	**30%**
Restaurants & Hotels	**Low**	**50%**
Transport	**Low**	**10%**
Clothing & Footwear	High	90%
Household furnishings	Medium - Low	60%
Alcohol & Tobacco	Medium - Low	25%
Communications	**High**	**90%**
Misc	**Medium - High**	**45%**
Education	**Medium - Low**	**50%**
Health	**Medium - Low**	**20%**
Housing & Utilities	**Medium - High**	**50%**
Food & Drink	Medium - High	20%



Source: HSBC estimates, OECD. Note: Bolded categories are services.

In the near term, as a result of COVID-19, we've seen a change in the consumer mix that makes our aggregate spending more online. The sectors where consumers have cut back most – such as restaurants and fuel are typically offline purchases, while consumers have shifted their spending from physical products to digital services. Already, this simple changing consumption mix may have added 1ppt to the share of consumption that is online, based on the spending mix within the US PCE data.

A change in spending patterns could push even more consumption online

This could easily be seen as a one-off impact due to lockdowns, but as we've seen, consumers' habits appear to have changed as a result of the nature of this crisis. We will see how much of this shift is permanent, but this consumption mix effect could get bigger and push the share of consumption that is digital even higher than the rough estimates we have here.

How tech ready are different economies?

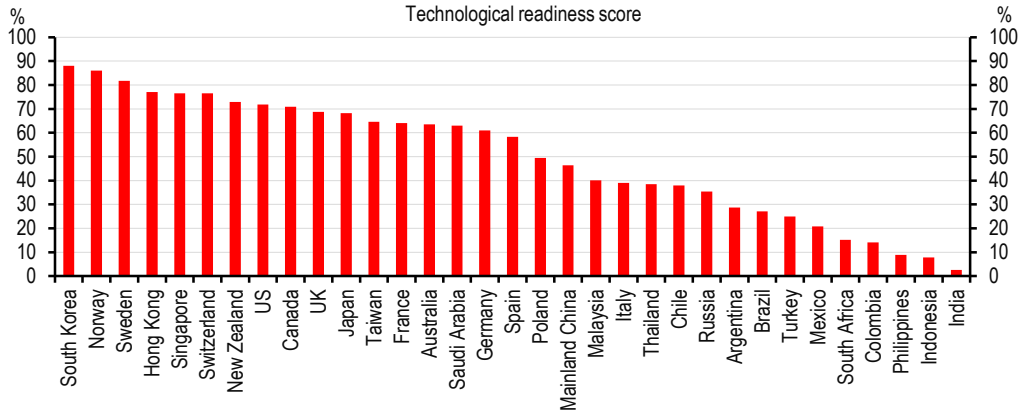
Of course, the speed at which the digital economy will grow will vary by country. But as a result of the pandemic and seeing the need for greater digital connectivity, we expect the supply side of digitisation to increase as a result – from both governments and private firms.

Who's got the tech? Which economies are ready?

Tech access is very important, and varies across the world

While mobile phone adoption has risen sharply across the emerging world in recent years, most emerging market countries do not have home broadband or the ability to use the internet at home in a way suitable for teleworking to anywhere near the degree of that of the developed world. We have produced our own measure of technology readiness across a broader range of countries using data from the World Economic Forum, ITU and *www.speedtest.net* (see: *A deeper drop: Cutting our global GDP forecasts*, 12 May 2020 for more details). We then ranked them according to their average score on six measures of availability of internet connections and internet speeds to provide a score for technology readiness. Chart 18 shows Korea and Norway at the top and India and Indonesia at the bottom.

18. Advanced economies tend to be more "technology ready" than emerging



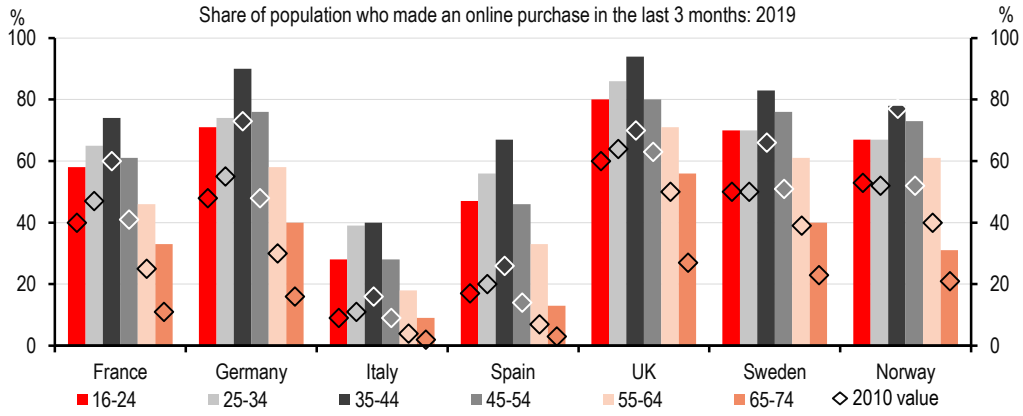
Source: HSBC based on data from WEF, ITU and www.speedtest.net/. Note: Score is average percent rank across 6 indicators looking at internet speeds, usage and availability.

It may well be that these countries will rely on smartphones and tablets as a gateway for work and education, skipping laptops and desktop computers all together, but in the short term this is damaging to economic output. The big technological divide within developed markets should be noted too. While in many advanced economies technology adoption is widespread, it is worth remembering that many lower-income households don't have access to the home computers and broadband[6] that are essential to work or study from home or to consume digitally to the same degree.

Don't ignore cultural aspects

Culture matters too. In Italy, online shopping is far less common than elsewhere in Europe. Data from Eurostat for 2019 shows that the average Italian under the age of 35 shops online less than the average British or Swedish pensioner. While some of this is due to a reduced uptake of digital devices in Italy, much of this is cultural.

19. Italians, culturally, don't shop online as much as other European nations



Source: Eurostat

The opposite is the case in arguably the world's most digital economy: Estonia. Estonia has embraced digitisation as a tool to make life simpler and better for all Estonians, with citizens embracing digital technologies. That has paid off during the current crisis, as 99% of government facilities were able to keep functioning through the pandemic and given that 87% of

[6] PEW Research Center survey of households with an income below USD30,000 per year showed only 54% have a home computer and 56% home broadband compared with 94% for both in households with an income above USD100,000 per year.

schools were already using e-solutions, shifting education online was easy. This digital footprint has helped to make the economy more resilient through this crisis, but has also played a part in building trust in institutions, improving educational attainment and making Estonia the most innovative economy in Europe[7].

More governments are committing to digital investment

So, thanks to lessons learned during the crisis, we expect many economies to focus on digital upgrading in the years ahead. So far we've seen greater commitments towards improving internet connectivity for businesses and households, with some of the clearest examples outlined in table 20.

20. Many parts of the world have put forwards ideas for digital investment

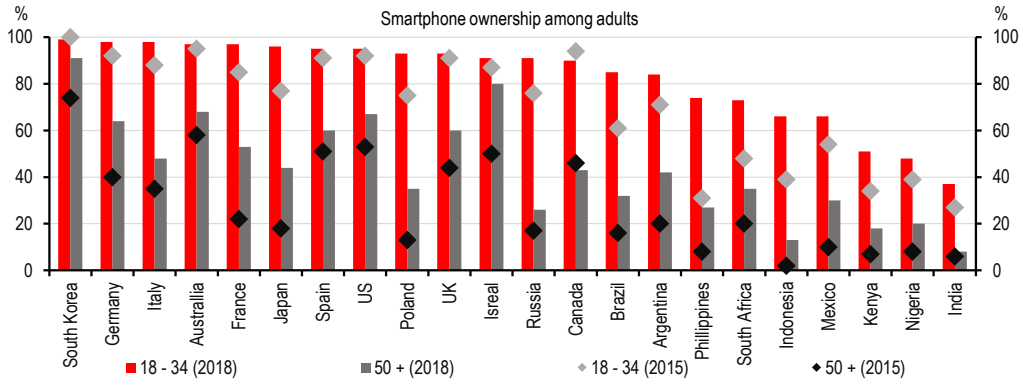
Country	Details
Austria	A EUR50bn fiscal package (13% of GDP) announced on 16 June, included stimulus measures on the expenditure side such as investment in digitalisation.
Germany	In June the federal government announced a stimulus package worth EUR130bn (4% of GDP), which included subsidies/investment for digitalisation.
Israel	In April, the parliament approved a fiscal package worth ILS80bn (6.1% of GDP). This package contains ILS8bn for infrastructure projects, including government digitalisation and IT support for SMEs.
Korea	The third supplementary budget, passed by the National Assembly on 3 July, totalled KRW35.1trn and included spending on digital industries. On 14 July, the government unveiled the roadmap for the 'Korean New Deal' stimulus package, partly funded by the third supplementary budget. One of the three main components of this package is the digital economy, with KRW58.2trn allocated for digital new deal projects of the KRW160trn to be injected over the next five years. Details include plans to train 100,000 people in AI, build a nationwide 5G network and make 140,000 sets of state data publicly available.
Lithuania	A EUR6.3bn investment plan (13% of GDP) was approved in June, of which EUR2.2bn was new investment, and this included investment in the digital economy and business through the end of 2021.
Malaysia	The fourth stimulus package of MYR21bn (1.4% of GDP) announced in June, included support for business digitalisation.
Thailand	Project: 'ASEAN Digital Hub'. A plan to turn Thailand into the digital hub of ASEAN. The cost of this project is estimated at USD0.2bn.

Source: IMF, National media reports, HSBC

In many EM economies, smartphone adoption is rising quickly

This, plus the continued spread of smartphones across the world (as their costs fall) will mean that in the coming decade ever more people across the world will have access to digital products and services. We could see the steady increase of online educational tools and healthcare apps that can help to lift growth across the emerging world. While of course, global growth faces numerous huge headwinds in the coming years due to scarring from the COVID-19 crisis, the widespread use of digital technology and investment in the space could provide a catalyst for growth in some parts of the world.

21. In many emerging markets, adoption rates of smartphones is rising quickly



Source: PEW Research Center

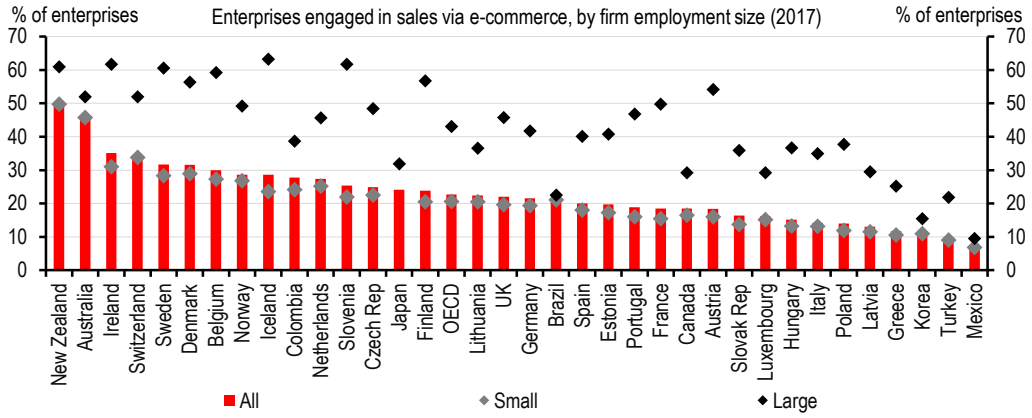
[7] Estonia built one of the world's most advanced digital societies. During COVID-19, that became a lifeline, World Economic Forum, 1 July 2020.

Mainland China's digital payments market shows how things can change

In some parts of the world, firms are already ready to engage with the digital economy. Mainland China is a clear case here, where AliPay dominates payments – with an estimated 48% of point-of-sale payments in China being made using mobile wallets, compared to 21.5% globally, and just 6% in the US (based on the WorldPay payments report 2019). The availability of these platforms bodes well for Asia's ability to shift towards more digital transactions in the coming years – with many Asian countries seeing mobile phone adoption rising quickly, digital payments spreading and a greater cultural willingness to embrace the digital economy.

From a business perspective we could see more investment from firms in being able to accept digital payments or to sell online – with only a small share of smaller firms in the OECD reporting as of 2017 that they were enabled to sell online.

22. In many parts of the world, firms (particularly small ones) are not geared up to sell online

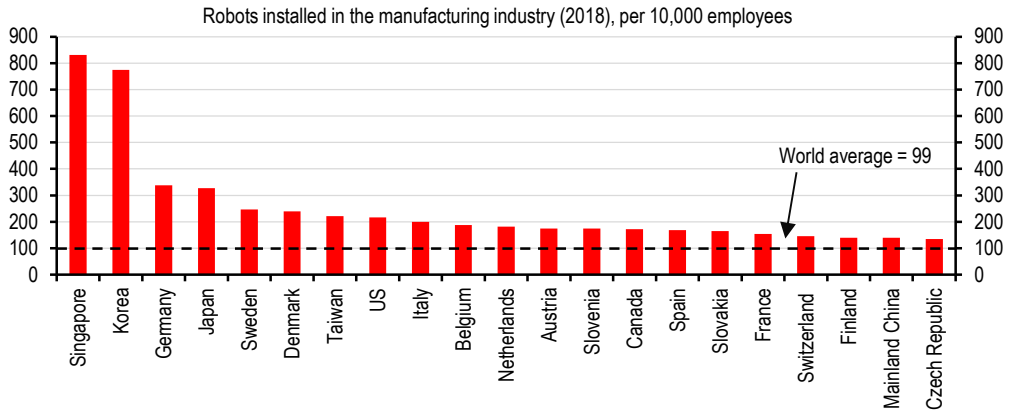


Source: OECD

Automation will likely increase too

And on the production side, we are likely to see further investment in robotics as automation increases. For many economies, the proliferation of industrial robots is very low but increasing steadily. Singapore and Korea lead the way globally on the spread of industrial robots, with Japan and Europe's main manufacturing centres next in the rankings, but some way behind. In a world of social distancing and businesses using this crisis to re-think their operations, we would expect investment in robotics to continue within industry in the coming years, particularly as the technology in the space means that more and more tasks are now able to be automated.

23. The degree of automation varies greatly across the world

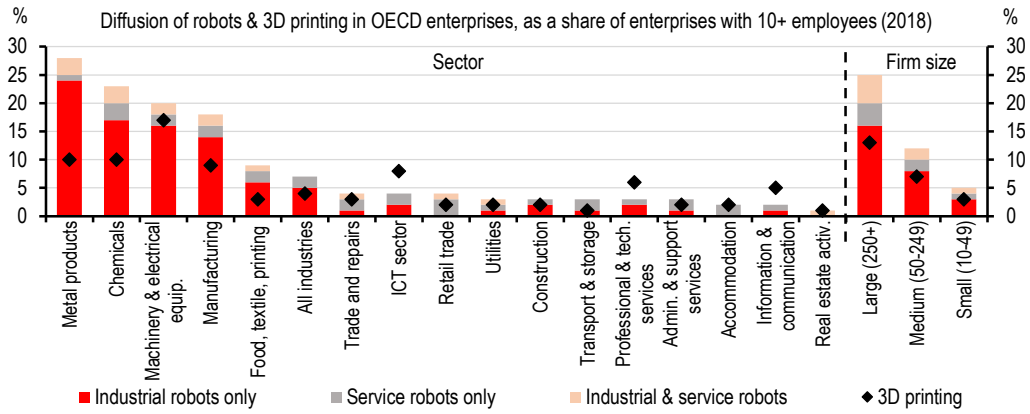


Source: OECD

Service robots could also become more widespread

And it's not just industrial robots that are on the rise. The International Federation of Robotics estimates[8] that the number of service robots in operation will rise quickly across a range of tasks in the coming years. They estimate that public relations robots, that can greet customers, will double in number between 2020 and 2022 while the number of professional cleaning robots will rise from 12,000 units to 19,000 units over the same timeframe. Of course, the usage of the latter will likely rise far more quickly in a post COVID-19 world with hygiene at the top of the list of priorities in many customer-facing businesses. Currently, according to data from the OECD (chart 24), most firms across all industries aren't using robots within their business activities, and so there is clear scope for this to rise in the coming years – particularly within the service sector.

24. Different industries have different levels of robot usage



Source: OECD

The demographic driver of technology adoption is still roaring

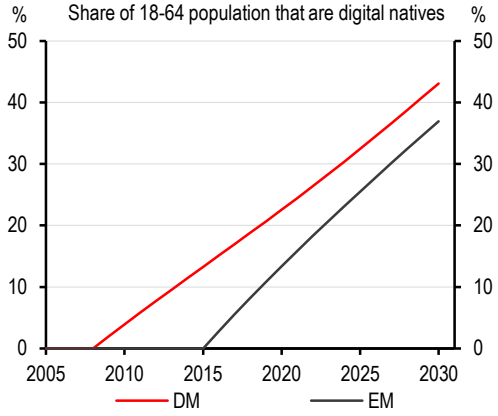
Demographics will push technology adoption

Whilst much has changed in terms of tech adoption as a result of the pandemic, the underlying demographic trend is still there, helping to push technology adoption much more aggressively in the coming years. We estimate that the rise of digital natives – that is the share of the working-age population who have grown up online – is set to double in the coming decade.

In the developed world today, roughly 22% of workers aged 18 or more were born since 1990, meaning that they attended secondary school after 2001 and will have therefore done a majority of their learning on digital platforms. This is set to rise to 43% by 2030.

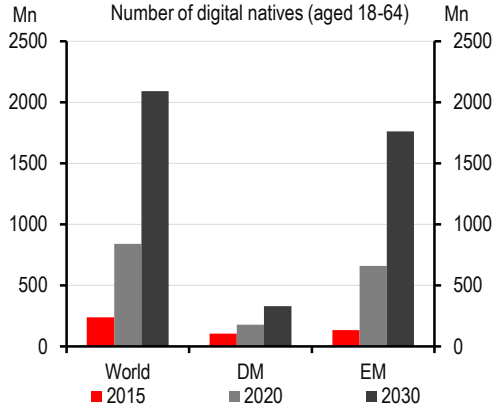
[8] See: International Federation of Robotics: World Robotics 2019 edition

25. A greater share of consumption will be made by digital natives…



Source: HSBC estimates using UN population division data

26. …meaning more than 2bn digital native consumers by 2030 across the world



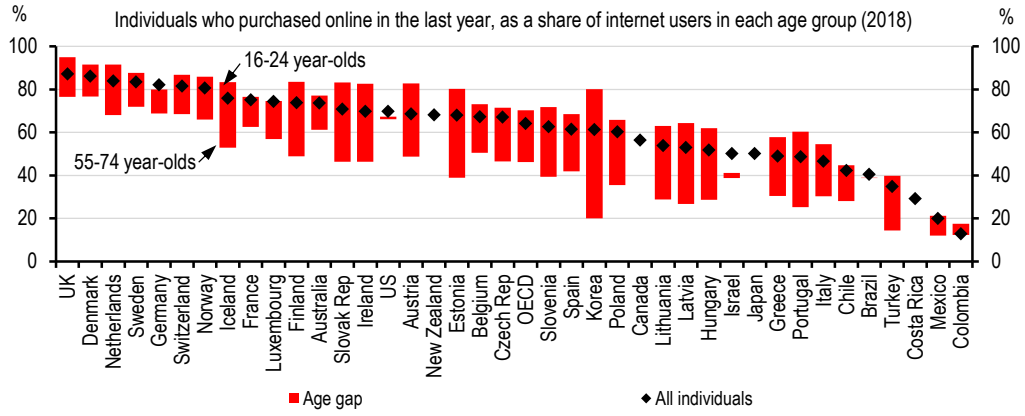
Source: HSBC estimates using UN population division data

In the emerging world we can use a slightly later birth date because of the slightly later spread of technology. Anyone born after 1997 would be classified as a digital native here, meaning they started their secondary education in a smartphone world. The share of digital natives in the emerging world is set to nearly triple from 13.4% to 36.9% in the coming decade.

A big generational divide in tech adoption

And that means that globally, by 2030 40.2% of consumers (up from 17.6% today) will be those who have grown up with digital technology. Younger generations are more likely to use digital technology for a variety of reasons – clearly they are more likely to own a smartphone or use social media than older generations. Surveys[9] also point to a greater willingness to try newer technologies such as virtual reality or autonomous vehicles from younger generations.

27. The demographic digital divide varies across the world



Source: OECD. Note: For some countries, 2018 data is unavailable, and so 2017 is used.

And because this digital native generation grew up with these technologies and older generations didn't, the mix of the population will continue to steadily make shopping, communicating, banking or learning digitally more commonplace.

Of course, all generations will continue to do these things more, but this demographic composition of the population is one of the biggest underlying trends on pushing the digital future. Even if nobody changed their own personal habits in the coming decade, the share of

[9] Such as HSBC's consumer survey, Jan 2019

economic activity that is done digitally would more than likely double, simply as a result of changing global demographics.

How big could the digital economy get?

The digital economy could get even bigger

Taking these four factors together it is easy to see how the digital economy is set to boom in the coming years. The share of consumption that is done digitally in one way or another could keep rising – and the 'shocks' caused by COVID-19 could easily become more permanent in this space.

The pandemic has changed consumer habits all over the world, particularly when it comes to digital technology. More people are shopping online or consuming products virtually than ever before, and early signs are that many of these behaviours are likely to become entrenched.

Demographics will continue to push the digital economy – and could easily contribute to a more-than doubling of the size of the digital economy in the coming decade. Consumers changing their attitudes towards digital consumption as a result of this pandemic could see the theoretical maximums be reached in terms of digital consumption – pushing up the share of consumption that relies on digital technology to just over 50% in economies where there is the appropriate infrastructure.

Governments all over the world will want to continue to build out digital capabilities. Not only can the digital economy help to create new industries and jobs, it can foster resilience to shocks – as we've seen with the relative resilience of the most technologically advanced economies in the world through 2020.

Investment will push up robot usage

Firms in many sectors, intent on both maintaining social distancing and cutting costs, will likely continue to invest in automation. While this presents challenges, as we will turn to in the next section, the opportunities for improvements in productivity are clear. If the world's largest economies were to catch up with Korea in terms of their robot usage today, we would see the number of global industrial robots rise four-fold between now and 2030. While that number may seem a large jump, the improvements in AI and robotics mean that more processes are able to be automated than ever before.

Likely will be most evident in Asia and northern Europe

In some parts of the world, this is more likely. Those with adequate levels of tech adoption today will find it easier for the digital economy to grow to its full potential, but the rapid spread of smartphones and internet access in the emerging world means that the room for growth is most evident there. Culturally, it appears that Asia and northern Europe will be the hotbeds of the digital economy in the coming years – as these regions have the highest rates of digital engagement today, making it easier to shift even more of the economy to a digital form. In other parts of the emerging world we could see a fast pace of growth as technology adoption rates rise.

And so, on any metric by which we would want to measure the digital economy – it's a structurally growing one, that will have vast consequences for the global economy – which we look at next.

What's the impact?

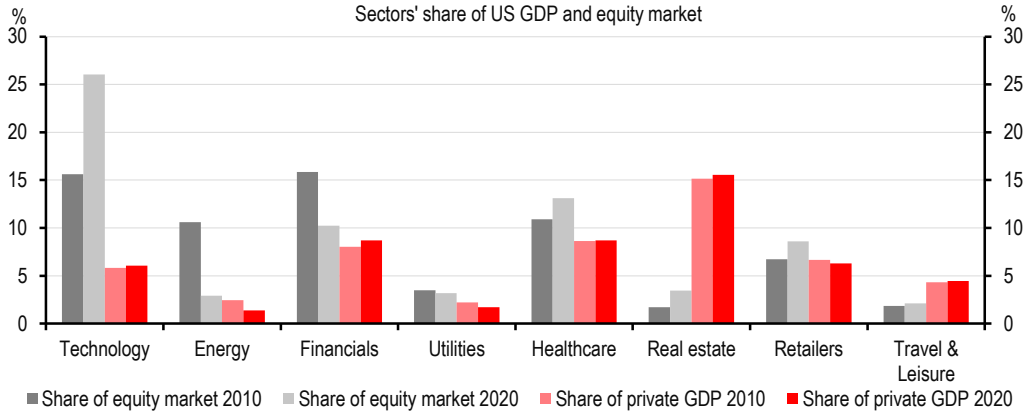
- A bigger digital economy will drive substantial macro changes…
- …from new jobs, new consumption patterns and lower inflation…
- …to having to rethink how we measure what is happening in real time

A new economy

Tech plays a bigger role in the stock market than GDP today

The disconnect between financial markets and the economy has been one of the biggest puzzles for investors during the summer of 2020. But a substantial share of this disconnect can be explained by the divide between technology's share of GDP and its share of the equity market. In the US, the technology sector accounts for more than 25% of the total equity market, but the information sector is just 5.2% of GDP. Between 2010 and 2020, while the sector's share of the equity market has risen by 10ppts, as a share of GDP it has hardly budged.

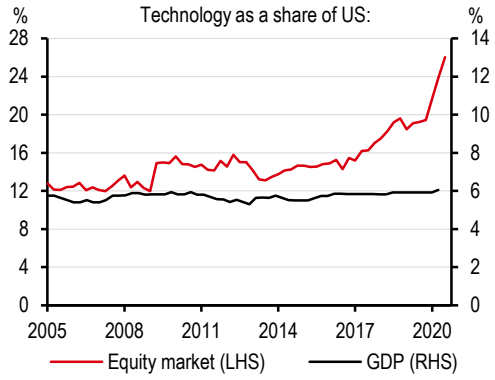
28. Tech firms make up a lot of the equity market, but barely feature in GDP



Source: HSBC, Refinitiv Datastream. Latest data used for equity market 2020. Information % GDP used for Technology.

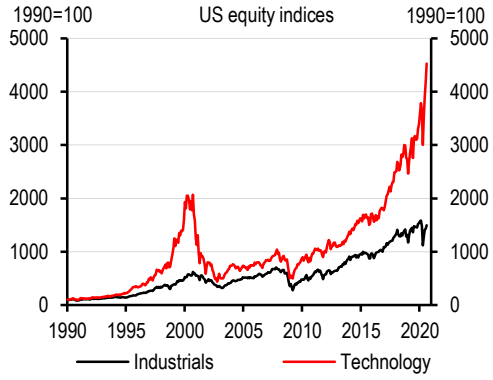
This is even clearer to see on a time-series basis. The technology sector has spent much of the past decade booming, while the industrials sector has grown much more slowly. Picking up this growth in the economy has proven difficult – the firms within the technology space have largely cannibalised more traditional industries – Amazon taking from bricks-and-mortar retailers, Facebook from telecoms companies and such.

29. Equity markets suggest that tech's role in the economy will get bigger…



Source: Refinitiv Datastream, HSBC

30. …as it replaces industrial activity



Source: Refinitiv Datastream, HSBC

Is the equity market pricing a more digital economy?

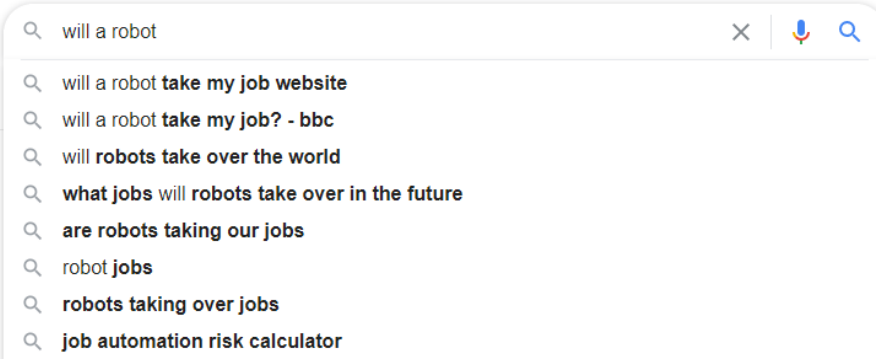
Simply, while technology firms have taken the stock market by storm, their impact on the economy has (so far) been relatively small. In theory, the market pricing is suggesting that over the longer term, the sector will grow dramatically within the real economy to close the gap. And based on the previous chapter, such a run up in the size of the digital economy seems extremely plausible.

As a result, there is scope for what have, so far, been small impacts on the global economy becoming even greater in the coming years. We outline some of the major ones next.

Jobs: will there be enough to go around?

One of the biggest concerns many people have surrounding the digital economy is the threat to jobs. It's both the number one question that arises in discussions surrounding the topic with clients, as well as the reason that most people search the internet for information about robots (chart 31).

31. People appear to be searching for the risk of automation of their jobs


will a robot
will a robot take my job website
will a robot take my job? - bbc
will robots take over the world
what jobs will robots take over in the future
are robots taking our jobs
robot jobs
robots taking over jobs
job automation risk calculator

Source: Google, HSBC

Many jobs are at risk from automation

We have discussed this topic at length in the past, such as in *The wage conundrum*, June 2017. But with more businesses opting to invest in automation as a result of the pandemic, the pressures on many jobs will no-doubt intensify at a time when the labour market already faces a number of threats.

Data from McKinsey and the World Economic Forum (WEF) from December 2019[10] suggested that by 2030 up to 800m jobs could be displaced as a result of automation. The same study argues that 14% of the workforce may have to change occupational category as a result of this disruption. Given the uncertain outlook for the world's labour markets in the coming years as a result of the recession brought about by COVID-19, further uncertainty and disruption won't be welcomed by workers who currently fear for their job.

32. The estimates for automation's impact on jobs vary, but it will be huge

Source	Summary
PwC	3% of jobs at risk because of automation by early 2020's and 30% by mid-2030's.
Deloitte	The average probability of all job groups at risk is 48% (2013)
ONS	Approximately 1.5 million jobs in England are at high risk of partly being automated in the future (2019)
World Economic Forum	Around 50% of current jobs have the ability to be automated (2019)
OECD	In OECD countries, around 14% of jobs are highly automatable. In addition, 32% of jobs could be altered due to automation (2018)
Mckinsey & Company	By 2030, 15% of hours worked globally have the potential to be automated. This is the mid-point of a scenario range of 0% - 30% (2017)
Oxford Economics	Estimate 20 million manufacturing jobs are expected to be lost by 2030.

Source: As listed

In theory, more jobs can be created, but unlikely right now

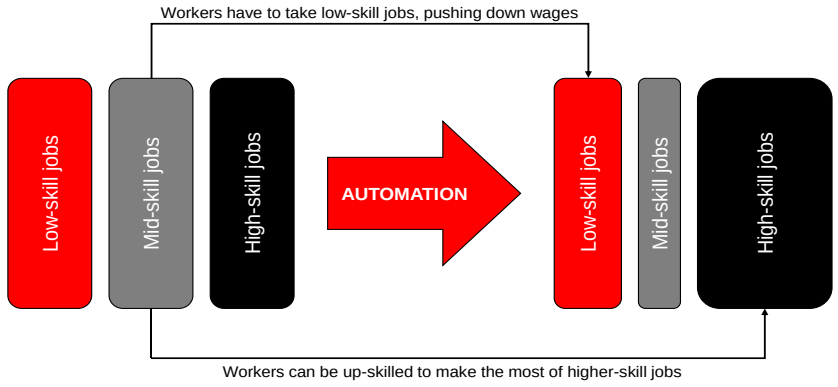
The one medium-term bright spot is the creation of new jobs from technological developments. The WEF's report, The Future of Jobs 2018, says that 75 million jobs will be displaced by artificial intelligence, robotics, and automation by 2022, but suggests that 133 million new jobs may be created as firms grow and new industries are created (such as coders or data analysts). Equally, many jobs either cannot be automated, or we as society don't want to automate them: think hairdressers. However, in the current climate this may prove difficult, given that many firms are unlikely to be expanding.

Inequality likely a bigger issue than jobs

Inequality issues are huge

The challenge is that even if enough jobs are available, the types of jobs that are most likely to be lost in the future are those that are lower-mid skill, while the jobs that are created are more likely to be higher skill. This creates a skills mismatch that means that without adequate training or reskilling available, many displaced workers may have to compete for lower skilled jobs, putting downward pressure on wages in those roles. Meanwhile, higher-skilled workers are more likely to have ample jobs and be able to demand higher wages.

33. With more mid-skill jobs being automated, training and re-skilling will be key



Source: HSBC

[10] Over half of the world's jobs are replaceable by a robot - is yours?, World Economic Forum, 16 December 2019

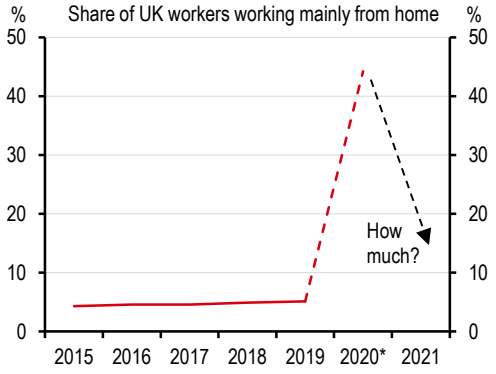
As we look at on page 34, this will create some enormous challenges for governments who worry about the possible employment and inequality impact of automation on the labour market.

Remote working morphs into flexible working

Will more people work flexible hours?

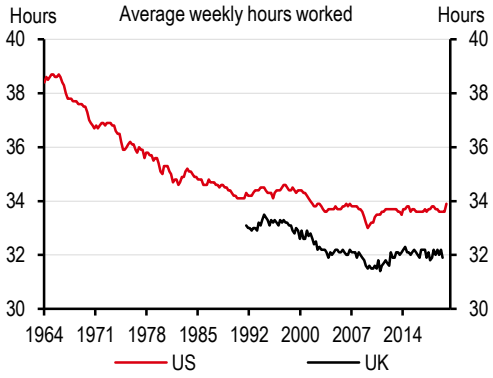
We have been writing about the shift away from offices and to home-working for many years, based on the premise that remote working would become more commonplace as the spread of connectivity can make it more feasible for many workers. This has clearly been accelerated as a result of the pandemic as many employers have had to come to terms with the practicalities of remote working and many of the taboos associated with it have been broken down. As we outlined in *Leaving the city*, July 2020, this will have a substantial impact on cities even if workers end up working from home even 2-3 days a week rather than the whole working week as has been the case for large parts of 2020.

34. More workers are set to work from home in 2021 and beyond, even if down from 2020



Source: HSBC estimates, ONS. Note: *2020 is estimate at peak

35. Hours worked have flat-lined in the past decade



Source: Refinitiv Datastream

Prior to the pandemic, the number of hours worked by the average employee in the US and the UK was the same as it was in the middle of the previous decade. Between 1990 and 2005, the average number of hours worked by US workers fell by 2% and over the subsequent 15 years to 2020 it has hardly budged. Given the progress made with regards to the ease of completing many tasks such as finding information, downloading data or sorting deliveries, the halt in the decline in the number of working hours is counterintuitive. Workers are either shifting into roles where there are not the same possible productivity gains (such as serving in a bar or café), producing much more in the same period of time (which doesn't fit with the productivity data) or simply working an unnecessary number of hours.

A possible productivity gain from flexible working or shorted working weeks

The shift to remote working can help to break the cycle of face time and fixed hours in many roles as long as there is no evidence of a drop in productivity. As firms start to embrace staff wellbeing even more, we could see flexible working become more commonplace – particularly as widespread access to systems, emails and colleagues is far easier at any time of the day, from any location.

This could help to bring about a productivity gain, with 77% of employees in the UK feeling that flexible working made them more productive, according to a study by Canada Life Group Insurance. As well as helping to raise productivity, fewer hours spent working will mean more time for leisure. New Zealand Prime Minister Jacinda Ardern argued that a four-day working week across the country could help to allow Kiwis to explore their own "backyard" and help the parts of the economy that rely

on the tourism industry ravaged by the pandemic[11]. In Germany, the largest trade union, IG Metall is suggesting a four-day week to save jobs in the automotive industry, with the reduced hours creating a way to retain the skilled workers and expertise needed for the transition as well as saving on redundancy costs[12]. The crisis is no-doubt going to lead to increased calls for these sorts of policies to be discussed, particularly as the trials so far have been successful: Microsoft Japan said sales were boosted by nearly 40% during an experiment where workers benefited from a three-day weekend on full pay.

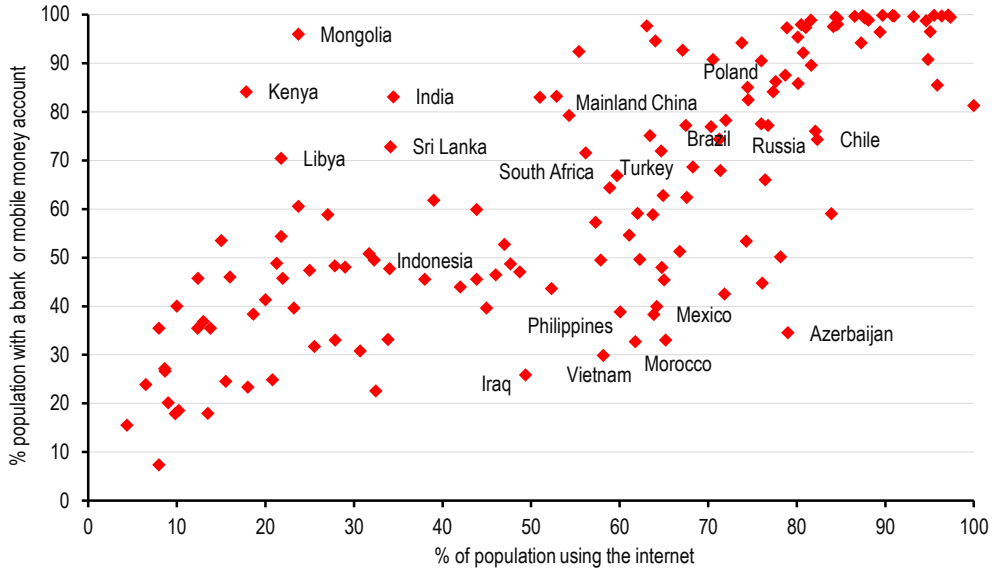
Cashless payments could drive up banking penetration

Digital payments spread drives banking penetration

The pandemic has sped up the world's move away from cash. As we outlined in *No cash, please*, 29 April 2020, businesses across the world have stopped accepting cash payments to the same degree as a result of COVID-19. Some of this has been pushed by governments or central banks in their policy settings (such as raising contactless payment limits in the UK or Australia) while some consumers have simply opted against using paper money. As a result, we've seen cash payments drop in many countries (including Germany and Japan, two of the most cash-loving economies in the world) and businesses are investing in technology that allows contactless payments to be taken cheaply and easily.

The technological developments on this front are key: the spread of QR code payments in many emerging markets, which can be accepted by a retailer simply displaying a code either physically or digitally which can be scanned. While in many countries with established banking systems, contactless bank card payments or near field communication (NFC) mobile payments (such as Apple Pay and Google Pay) are popular, QR code payments create a more affordable option for much of the emerging world.

36. Many economies are well-placed to adopt mobile money



Source: World Bank Databank, HSBC. Note: data is latest available for 2018 or 2019.

[11] New Zealand Prime Minister opens door to 4-day working week, World Economic Forum, 20 May 2020
[12] Germany eyes a four-day week to help prevent mass layoffs, World Economic Forum, 25 August 2020

This means that those places with high level of technology adoption or mobile phone penetration will be well placed to gain from this shift. In the likes of Mexico, Vietnam or the Philippines, banking penetration rates remain low but internet adoption rates are high: clear candidates to shift towards mobile payments. Kenya and India have well established mobile money industries already and although cash payments are still prevalent in both countries, the groundwork for further adoption of digital payments is set.

Possibly a huge lift to global growth

This alone could have a transformative effect on the global economy. Estimates from McKinsey[13] suggest that digital finance has the potential to provide access to financial services for 1.6bn people in the emerging world. This could increase the volume of loans to people and businesses by USD2.1trn and allow governments to save USD110bn per year by reducing leakage in spending and tax revenue. Financial-services providers could save USD400bn in costs. Overall, they estimate that the widespread use of digital finance could boost GDP by 6% by 2025 compared to a baseline scenario, with nearly 2/3 of the increase coming from the raised productivity of businesses and governments as a result of digital payments. The remainder of the growth is set to come from investment in the digital infrastructure required. While this estimate probably overestimates the gains to be had, there is a clearly an economic benefit of raising banking penetration rates.

Disinflation – lower costs plus increased competition

Near term, COVID-19 impacts dominate inflation

The debate on inflation right now is centred on whether inflation will remain low, with price increases held back by weak consumer demand and elevated unemployment (as Janet Henry outlined in *Global inflation: What does COVID-19 mean for prices?*, 4 May 2020), or whether the enormous degree of stimulus and supply chain disruption could lead inflation to move higher (Simon Wells outlines these risks in *The death of disinflation?*, 7 September 2020).

But over the medium term, a more digitised economy should mean lower inflation rates, all else being equal. There are two main channels by which this can happen – firstly that businesses face increased competitive pressures and therefore cannot raise their prices as much as they might otherwise, and secondly that lower costs from productivity gains can mean that there is less of a need to raise prices too.

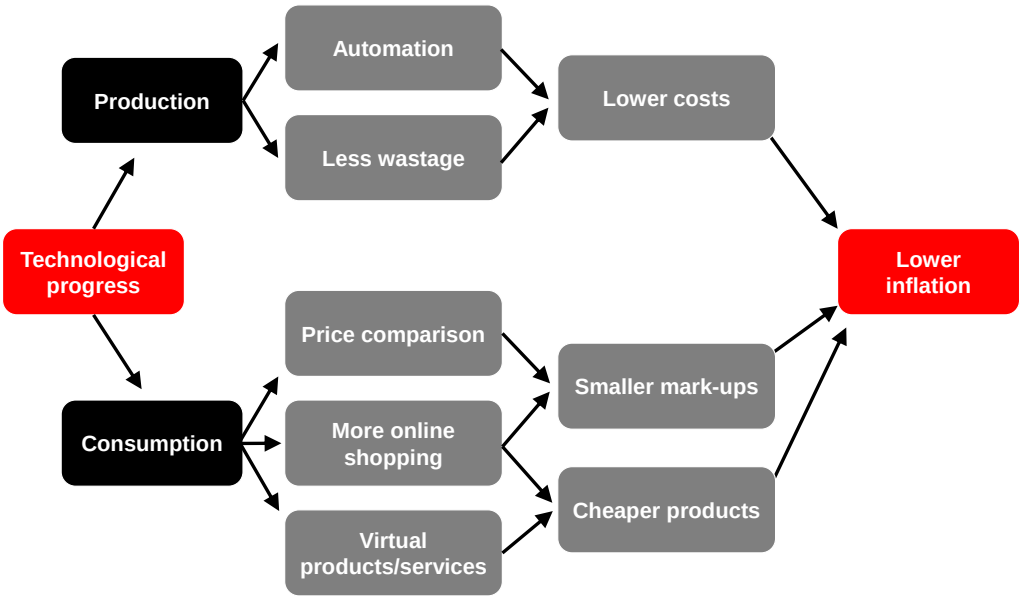
Lower prices further out

Empirical work from the IMF[14] (from a sample of 36 economies) also suggests that digitalisation is a key determinant of the global and structural components of inflation, as well as reducing short-term inflation, particularly since 2012. The analysis suggests that most of the impact is through both productivity gains and increased competitive pressures.

A large survey from the ECB in 2018[15] found that while many companies suggested that they are seeing (or expect to see) a notable improvement in productivity from technological developments, many also see it as a good opportunity to raise their prices – if they can. The paper does note however, that higher sales prices could reflect greater added value – and still be consistent with digitalisation putting downward pressure on producer prices for goods and services on a "like-for-like" basis. The same survey also shows a notably higher indirect impact of digitisation on prices – coming through competitors' behaviour.

[13] Digital finance for all: Powering inclusive growth in emerging economies, McKinsey Global Institute, September 2016
[14] Is Digitalization Driving Domestic Inflation?, Balazs Csonto, Yuxuan Huang, and Camilo E. Tovar, IMF Working paper 19/271
[15] Digitalisation and its impact on the economy: insights from a survey of large companies, Prepared by Catherine Elding and Richard Morris, Published as part of the ECB Economic Bulletin, Issue 7/2018.

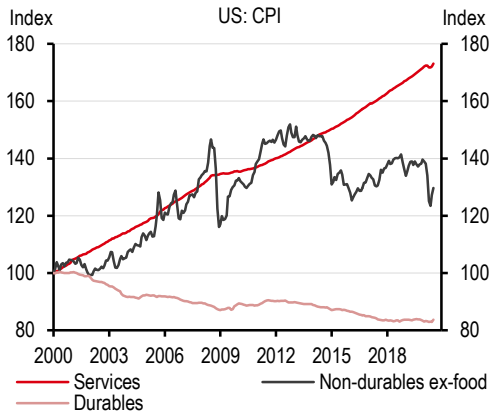
37. Digitisation will lower inflation rates via a number of channels



Source: HSBC

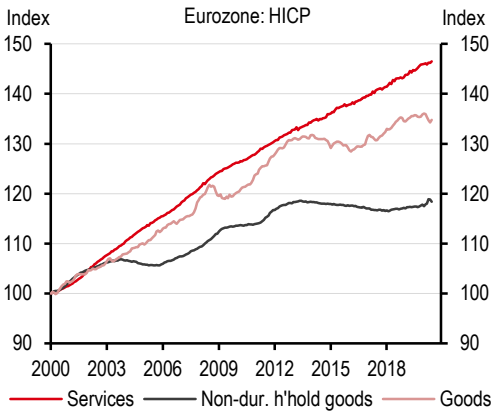
The first instance, which is sometimes called the "Amazon effect" is that consumers can now have easy access to price information, meaning that so-called 'shoe leather costs' are eradicated and so firms' pricing power is diminished. This can be partly through there being more sellers for products, but also from price comparison websites. We estimate that roughly 2/3rds of US goods consumption can be easily price-compared prior to a purchase[16].

38. As services prices have kept rising, durable goods costs have fallen, whilst non-durables have turned since 2012



Source: Refinitiv Datastream

39. And in Europe, household goods prices stopped rising after 2012



Source: Refinitiv Datastream

And for firms, the growing automation of processes means that marginal costs of both production and supply and falling. This can be that processes are streamlined, human cost is taken out, or simply that wastage is reduced. The latter point is particularly relevant in the emerging world where the current level of food wastage is much higher. Estimates suggest that globally 1.6bn tonnes of food (roughly USD1.2trn worth) is wasted every year, and in India, USD14bn of food is lost every

[16] Based on analysis of US PCE. Items which are likely to be made based on location or timeliness are assumed to be non-comparable such as fresh food, fuel and medical products.

year through poor cold chain facilities[17], which can be dramatically cut with digitised supply chains that track end demand, temperatures and logistics in real time. This drop in wastage could have a dramatic impact on food prices and headline inflation in the emerging world.

Services prices are less impacted by digital transformation

The same impact is less likely to befall many services in what we are loosely calling "The Ed Sheeran effect". Even though there is greater ability to price compare for many services, the product itself varies much more than for goods. This could be a flight with a different airline, a holiday in a different hotel or dinner at a different restaurant. While the ability to compare across competitors may limit the prices some providers are able to charge, for many (particularly high end discretionary) services, pricing power remains intact due to limited supply. The best examples are gigs by top artists or a prime-time Saturday night table at the best restaurant in town. There will be pockets of inflation that have nothing to do with technological developments, but on the whole, the influence of a broader spread of tech is likely to be disinflationary.

As technological usage spreads even further, both to consumers and firms, these pressures will no doubt intensify. But, of course there is a risk of monopoly power if large technology firms become the sole (or dominant) supplier of many goods and services. While this is of course a risk, it can also be argued that the relatively low costs of entry to many markets that many digital innovations create means that the ability to use this market power may be lower with digital firms than with non-digital ones.

Spending patterns: leisure to come back strongly?

While there are many debates surrounding the impact of the continued digitisation of the economy one thing that seems pretty clear is that it saves time. Processes can be automated, purchases can be made more quickly and finding out information can take seconds rather than hours.

Tech helps to create more time. What will we do with it?

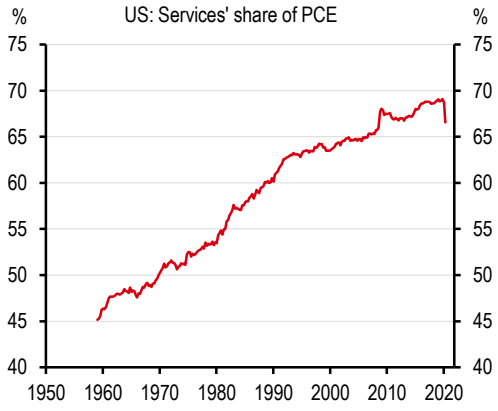
As we said earlier, this should eventually mean shorter working weeks, but already we save time in a number of daily tasks thanks to technological innovations. This may be buying flights online vs going to a shop, self-checkouts meaning a faster experience (for many) at the supermarket or even settling a debate with friends in a bar or finding out the football scores.

Demand for leisure and content

In all of these cases, the time saved can be used for more leisure time (either physical leisure activities or consuming content such as video, podcasts or books). Although the COVID-19 pandemic has led to a sudden stop in many physical leisure services, the trend of greater spending on services as well as more people being employed within leisure and hospitality had been an extremely strong trend for the previous 50 years. While in the near term, caution over the spread of the virus and large crowds will mean the recovery in the hospitality sector will be slow unless we see a vaccine – the additional time that is created from technological advancements will almost certainly be devoted to leisure in one way or another, particularly amongst those whose job prospects are not weakened and can opt to spend their money accordingly. The ability to easily create content in one way shape or form (think YouTubers or podcasters) could also provide income opportunities (if not with the same job security as traditional employment) for many.

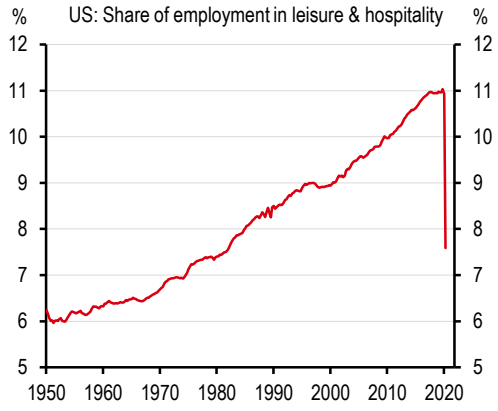
[17] Can the digitalization of the supply chain reduce global food waste?, Packaging Europe, 9 January 2020

40. Services have kept increasing as a share of total spending



Source: Refinitiv Datastream

41. The slow march of hospitality has taken a pause

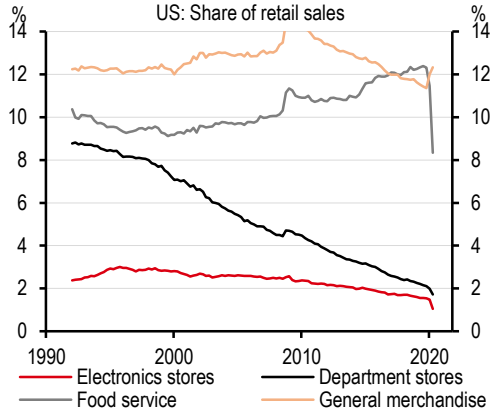


Source: Refinitiv Datastream

What will replace high street shops?

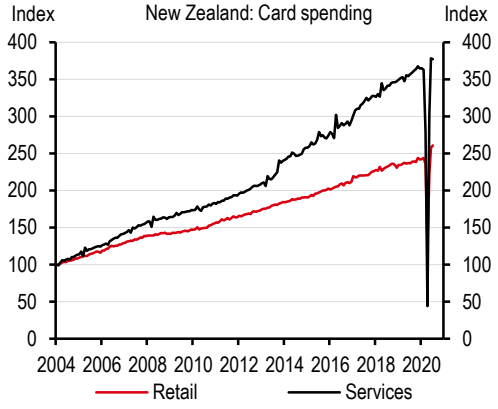
As remote working has become more commonplace, there are now big questions about the changing shape of urban area. As more shopping goes online, high streets' decline as shopping venues will likely be accelerated. But, previously where these shops were replaced by cafes and restaurants, how likely is that to be the case if more people are working away from city centres? This could clearly pose a broader risk to the recovery. Although a sharp recovery in the leisure sector may feel a long way away right now, in New Zealand we saw a rapid rebound in services spending as social distancing was first relaxed – resuming the previous uptrend that had accelerated since 2014.

42. The steady replacement of retail sales should revive in the years ahead



Source: Refinitiv Datastream. Note: Quarterly data taken to smooth.

43. New Zealand showed how quickly services spending can come back



Source: Stats NZ

Measurement challenges

Harder to pick up GDP

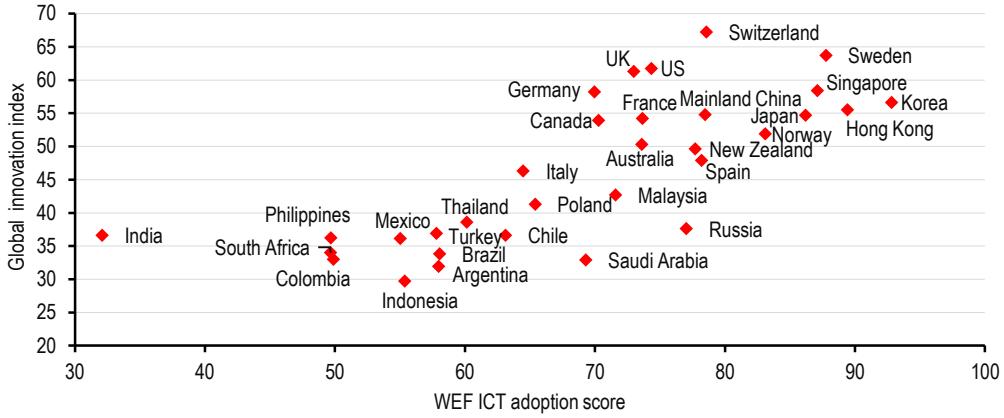
Investment to come in tech and ideas, non-tangibles

Clearly in a world where governments and businesses have an incentive to invest in technological upgrading, a greater share of fixed capital investment in the coming years will no doubt be focused on improving connectivity, automation and similar areas.

Firstly, this could lead to more entrepreneurship. Connectivity breeds ideas, linkages and access to a bigger market that incentivises would-be entrepreneurs to take risks and start new businesses. There is a clear link between ICT adoption and innovation across the world – and as more people across

the world have access to others who can help to put their fledgling ideas to work, we could see more firms be created than ever before.

44. Digital adoption may help to lift innovation

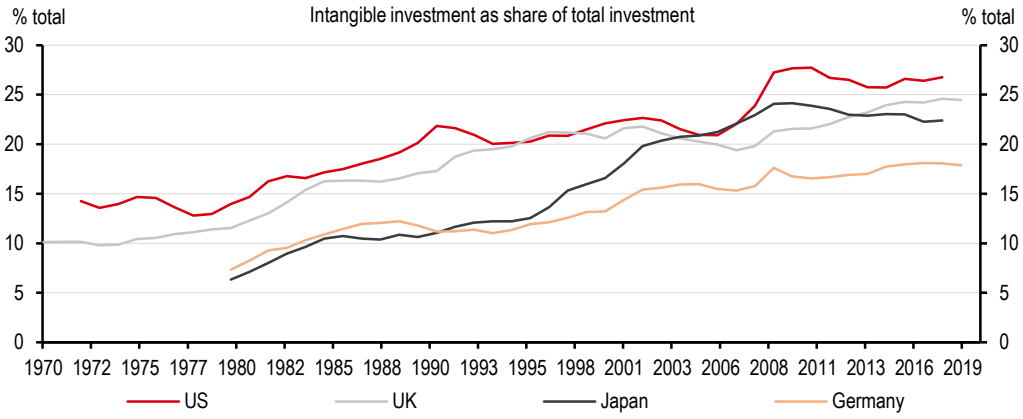


Source: Refinitiv Datastream, WEF, Global Innovation Index

More intangible investment

On the investment front − while this means that we could see support to traditional data in the near term as investment has some underlying support, going forward it may mean that more investment made by businesses is in intangibles; broadly defined as: computerised information, intellectual property, human capital and economic competencies such as market research.

45. Intangible investment has been rising more quickly than tangible investment



Source: OECD National Accounts

These investments are harder to capture. This has been a problem for many decades: a paper from the NBER[18] highlights that because accounting practices traditionally exclude investment in intangible knowledge capital, this "excluded approximately USD1trn from the conventionally measured output of the non-farm business sector by the late 1990s, understating the business capital stock by USD3.6trn". As measured, in chart 45, intangible investment has been rising as a share of the total for many decades.

[18] Intangible Capital and Economic Growth, Carol A. Corrado, Charles R. Hulten, Daniel E. Sichel, NBER Working Paper No. 11948

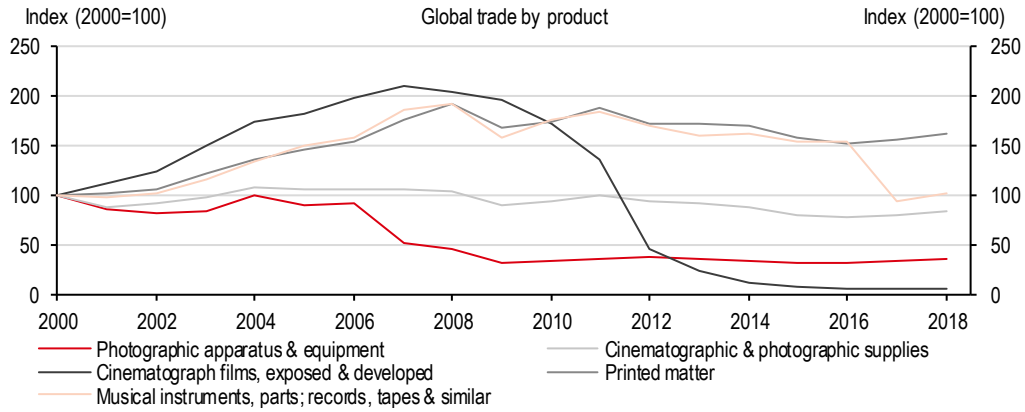
This will get harder to track if more investment comes from tech firms

But, this adds to the problems – as (now UK MPC member) Jonathan Haskel and Stian Westlake wrote in their book, Capitalism without capital, the size of intangible investment in Europe and the US likely overtook tangible investment around 2008. Given the drivers of this (scalability, sunkenness, spillovers, and synergies as Haskel and Stian put it), and mainly because intangibles can be scaled up more easily, the chances are that intangible investment could be running at levels far higher than national accounts currently capture and that aggregate levels of investment could grow more quickly in the coming years than we can physically see before our eyes.

Picking up production and trade may be harder

Capturing the true level of activity in the economy is becoming more difficult as the world moves away from physical to digital transactions (as discussed in *World in 2030*, September 2018). This will happen in a number of ways: physical items won't be produced, they won't be shipped and they won't be consumed. This is most evident in the global trade data, showing how the amount of shipments of many products that are vulnerable to being replaced with digital alternatives has been steadily falling for many years.

46. Global trade in many products has been in structural decline due to the digital economy

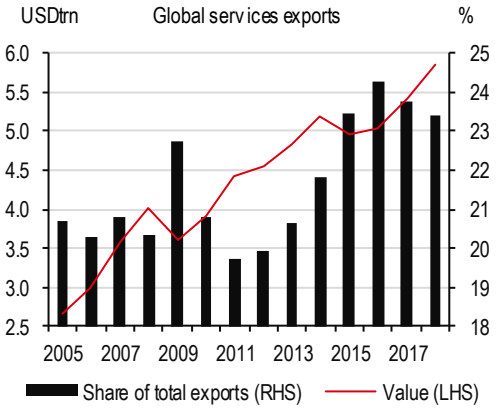


Source: HSBC, UNCTAD. .

Creative works have gone digital, removing physical production

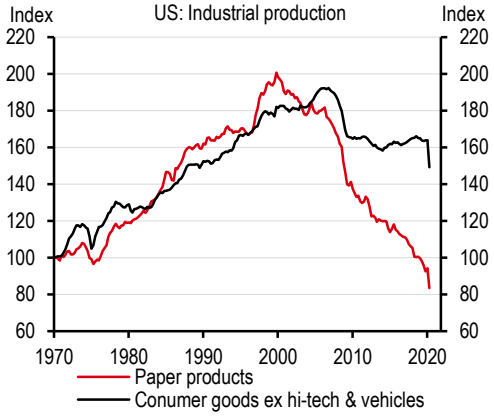
In recent years, technological developments have pushed many creative works such as text, image and music onto digital platforms and online. This has led to a fall in the trade of certain goods and, in some cases, this trade has almost disappeared. We can see this unfold in chart 46, with a significant decline in the trade of products such as records, tapes and DVDs. Some products such as printed matter (books, newspapers, postcards) have edged only slightly lower over the last decade suggesting this digital substitution may not be taking hold for all goods. And the total trade of digitisable goods (physical goods that can be digitalised such as CDs, books and newspapers) have only been modestly declining in recent years. But when we look at the share of these digitisable goods in total imports the decline is much clearer. In the WTO's 2018 World Trade Report they noted that the current value of imports of digitisable goods by WTO members, not accounting for intra-EU trade, was around 0.8% of total imports in 2016. Whereas in 2000, total imports of digitisable goods stood at 2.86% of total imports. This is a much more notable decline.

47. Where digital goods can replace physical, hard data will be affected



Source: HSBC, UNCTAD

48. Industrial production is weighed on by certain categories



Source: Refinitiv Datastream

Services getting bigger as a share of GDP

As the size of services trade continues to grow, the issue surrounding the timeliness of this data grows too. It is well known that there is a greater degree of difficulty in measuring trade in services than trade in goods[19]. The services themselves are not only more difficult to define, but there is no physical package moving between countries and through custom checks which we can document. To measure trade in services we rely on a variety of data sources, such as surveying a proportion of firms who import and export services and then producing estimates for the country as a whole. This helps to explain why measuring services trade in real-time can be tricky. The inherent difficulty in measuring the data means it often lags the corresponding data for goods. And this issue will only become more prominent as trade in services becomes a larger share of total trade.

On top of this, there is the rising possibility that businesses adopt technologies such as 3D printing and automation that enable production to be near-shored. See: *Future of global trade: The technology transformation*, 6 November 2019 for more details.

All of this creates problems in terms of measuring the level of activity in real time – as the substitution effects may be hard for statistics offices to keep up with and a greater share of activity is harder to capture.

We can also find new data sources

But, technological advances also create some solutions. In the midst of the pandemic, investors were looking for timely data to measure the rapidly evolving economic situation across the world. While traditional economic data are often released with a significant lag, tech has provided us with data solutions to track the economy in real-time, such as Google's mobility data, credit & debit card spending data and online job postings data to track the employment situation in various countries. Our Data Science team explored these alternative datasets in their report *Data Matters: Alternative Data Matters*, 23 July 2020, suggesting that these alternative datasets could lose their appeal for macro investors once economic conditions normalise, as the timeliness of the data becomes less attractive when conditions are changing less frequently, but it is important to remember how useful real time data can be when tracking the economy.

All in all, further digitalisation of the global economy will have profound implications for economic data, jobs and wellbeing. It will also create some big policy headaches – which we look at next.

19 Measuring trade – why does the world seem to import more than it exports?, ONS, 18 July 2017 and Manual on Statistics of international trade in services, UN, 2002.

Policy challenges

- Policymakers will have to think even more about inequality…
- …both in terms of access to technology and the risk to jobs…
- …meaning that new policy tools may have to be used

A more digital economy will mean that policymakers of all guises will have to think even more about the most appropriate policy tools to implement in this changing world. We outline some of these considerations below.

Fiscal & social policy

Support for digital investment

Governments will need to improve spending on digital access and speeds

The first, very simple conclusion, is that more governments across the world are going to have to invest further in digital infrastructure. This could be in terms of improving broadband speeds, investing in 5G networks or engaging in policies designed to improve access to digital technology. Governments will also have to continue to shift more government services online. During the pandemic, many basic government services were hard to access due to distancing – such as applying to passports, registering births or signing up for benefits[20], and so governments all over the world will have to think about how to make these services more efficient and easier to access.

Taxes

Given the cross-border nature of the digital economy, governments are likely to have to work together more closely to manage the number of challenges arising in the areas of data management, cybercrime and trade.

Taxing the digital economy creates new challenges

And tax is the dominant one. Due to the nature of existing tax systems, many digital transactions are not captured in the country that are consumed in. Multinationals typically pay corporate income tax where production occurs, rather than where their users are. In the digital economy, businesses more easily derive income from overseas users but are not subject to corporate taxes in those jurisdictions. As a result, the OECD is leading negotiations to adapt the tax system, to ensure that multinational businesses pay some of their income taxes where their consumers or users are located.

However, in the absence of a global solution on digital taxes, many countries have taken to announcing their own unilateral measures, with more than half of European OECD countries having announced, proposed, or implemented a digital services tax (DST) according to Tax Foundation. This has stoked retaliatory threats from the US, as these taxes primarily target American firms.

[20] Covid-19 is spurring the digitisation of government, The Economist, 1 September 2020

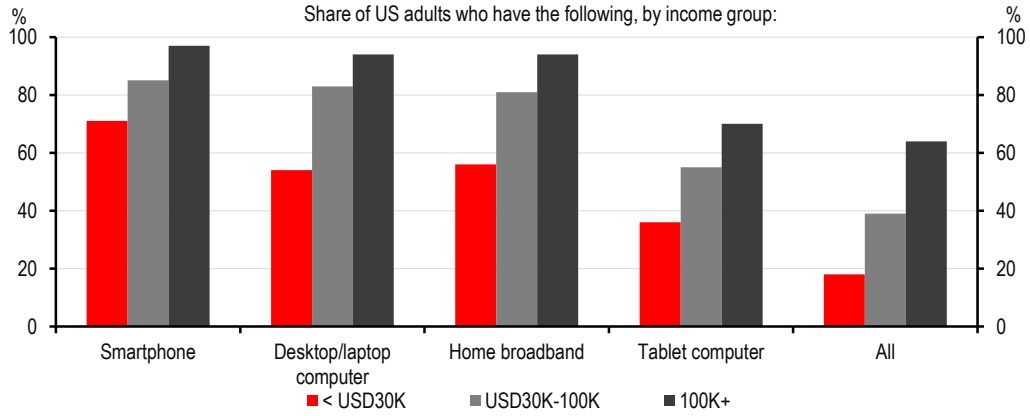
Digital taxes are likely to become an even bigger part of both the tax and trade discourse – and HSBC's trade economist Shanella Rajanayagam's piece on *Taxing digital trade: Are current rules fit for the future?*, 19 June 2019 sets out these challenges in more detail.

Inequality

The biggest challenge facing governments

One of the biggest issues the more digital economy creates is widening income inequality. Many lower-income households don't have access to technology that allows them to thrive in a more digital economy. This may hamper their skillset that is needed for many of the jobs that are created or limit the ability for children from low-income households to succeed within the education system. Policy to correct this – by improving access to digital devices – should be one of the top priorities of governments in the coming years, especially after this digital divide has been shown to be so harmful during the COVID-19 pandemic.

49. There is a big digital divide between income groups



Source: PEW Research Centre. Survey conducted 8 Jan – 7 Feb 2019.

Job losses will likely be concentrated in low-wage roles

On the jobs front, whilst it could well be that there are enough jobs to go around in a world of greater automation, the fact that job losses are more concentrated in lower-skill and lower-income roles means that we will quite likely end up in a world with much greater levels of income inequality (see: *Global Economics Quarterly: The inequality challenge*, December 2017). Those who are able to automate, and those who own capital, could win at the expense of workers.

That will no doubt bring back more detailed discussions around the policies that could help to alleviate this problem.

- Universal basic income (UBI)
- Jobs guarantees
- Robot taxes
- Minimum/living wages
- Re-skilling programmes

These policy tools all have their merits but also face challenges, as we outline in table 50 below. While it remains to be seen whether any major economies will adopt these policies going forward, they will no-doubt enter the discussions in the coming years.

50. The pros and cons of policies that may need more consideration

Policy Option	Pros	Cons	Examples/experiments
Universal Basic Income (UBI) *A standardised payment made to all members of society to replace current benefits payouts.*	Allows people to still have an income even if their job is automated away by technology. Simplifies benefits system – particularly useful for small countries. May give flexibility for workers to retrain or start new businesses.	May actually raise poverty rates, if OECD is to be believed. Requires taxes to go up to pay for additional costs. Workers may not have the same incentives to work.	Two year study in Finland in 2017-18 found that while some individuals found work, they were no more likely to do so than a control group of people who weren't given the money, but happiness did increase. More, smaller, trials are in progress or in planning, including a privately funded trial in Germany involving 120 people over 3 years.
Jobs guarantee *The government provides employment for all members of society who want one*	Supports employment in a world where demand for labour in certain sectors may be falling.	Adds jobs that may not be needed, so bad for productivity. May lead to bloated public sector. Doesn't necessarily solve wage growth problem.	No examples as of yet. However, the suggestion would be that employment would either be in existing government departments or new ones would be created via nationalisation or opening new state-run enterprises. Roles could be undertaken in partnership with private companies.
Robot tax *Where taxes are placed on robots that replace human labour*	Allows governments to keep income tax up as labour diverts into automation.	May discourage investment in automation that is key for growth. Hard to implement and police as to which robots are deemed to have replaced labour and which support it.	No experiments as yet but Bill Gates is one of the biggest advocates, arguing that it would stem the tide of automation, while funding the training of workers for other forms of employment. Such a proposal was rejected by the EU in February 2017.
Living wage/ job subsidies *Raising wages to a sufficient standard, or wages to be topped up*	May support wage growth in sectors where wages are being squeezed.	How does this play out in the informal sector/gig economy? Does this mean that higher wages actually intensify the move towards automation?	The UK living wage has been pushed out as a way to encourage employers to pay a higher wage to low-paid staff. While it's not compulsory, it has led to a higher official minimum wage and many large employers have agreed to pay the living wage.
Training *Providing developmental training that allows workers to move into more skilled employment with higher wages*	Can improve the productivity of individual workers. Relatively low cost. Can target at workers/industries where training is needed. May tackle the skills gap in the economy.	May not offset the fall in labour demand as is replaced by automation. Economy still needs low-skilled workers. May not be enough 'skilled' jobs for all better-trained people.	Individual training accounts, where workers have access to personalised training needs has been rolled out in Singapore. A similar scheme has been rolled out in Scotland in 2017 providing workers with access to £200 per year to spend on training and development. Germany's famed apprenticeships are seen as a model for other countries.

Source: HSBC, original version published in Global Economics Quarterly Q3 2018, The Wage Conundrum, June 2018.

Whatever policies that are adopted, we will need to see training at the forefront. This is of particular importance right now with the large number of jobs lost on the back of COVID-19 induced disruption, and will be a key part of any fiscal policy package across the world in the years to come as workers' job mobility remains so crucial.

Clearly, despite some of the benefits of a more digital economy, there are a number of substantial challenges for policymakers in the years ahead.

Tech makes it all possible

- A number of developing technologies can fuel the growth in the digital economy
- With data needs, virtual reality and improvements in automation…
- …allowing more people to become connected and shape the new economy

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Growth of the digital economy can help drive a process we call unbundling the city ("Unbundling the city: beyond urbanisation", May 2017). In a nutshell, unbundling the city means, that citizens around the world, both DM and EM, can have access jobs, services, e-commerce, education, healthcare, entertainment and more – independent of their physical location. As we outline in this note, digitisation is set to drive 20-25% of GDP (for most OECD countries) by 2030, roughly double the share today. In this section we outline some key technologies that can enable this acceleration of the digital economy:

- Space-based internet – connecting the unconnected becomes important to create a more digital economy globally
- Data centres – increased connectivity will drive more data centre growth
- Virtual reality – many of our everyday activities like working from home (WFH) and entertainment like streaming movies have moved to digital, will more experiences go digital next?
- Automation – a growth in the digital economy will need to be supported by more automation than before

Space-based internet can bridge the digital divide, making countries more "tech ready"

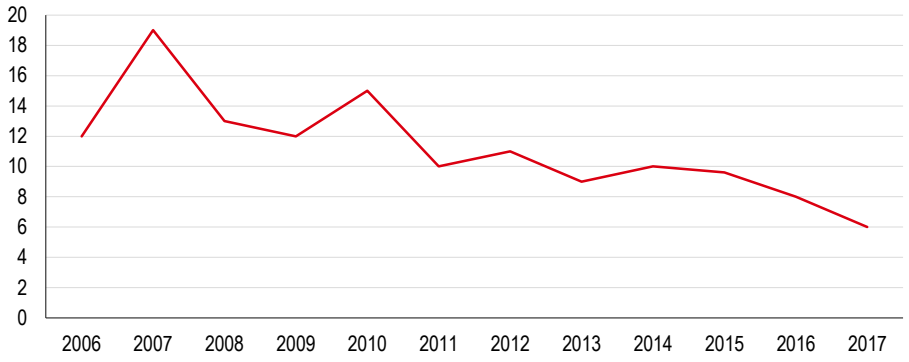
Low cost space-based internet to connect 350m people in the coming decade

To enable the modern digital economy, universal connectivity becomes paramount. According to the ITU, approximately 3.9bn people are online today − or about 51% of the world. However, the rest of the population remains unconnected and 1.25bn of these citizens, where 95% of them are in the DM, lack access to 3G or 4G networks. The ITU also suggests that the next 50% of the world maybe more difficult to bring online, as they maybe in regions tougher to connect for economic and geographical reasons. Chart 51 shows, that internet growth has been slowing and this poses a bottleneck to getting more of the economy online.

We believe that that next generation space-based internet from the likes of SpaceX, Amazon, OneWeb, Telesat and Leosat may help bridge the digital divide and help provide affordable internet to 350m people globally in the coming decade. Chinese company iSpace is also developing re-usable rockets to launch into low earth orbit (LEO). We believe SpaceX's LEO satellite constellation is the most mature, and could deliver its first customers by the end of the year. These trends should assist more of the unconnected in the DM (20%) and EM (55%) get online and contribute to global

growth going forward from digital consumption. See "Leapfrog 2.0 – from hype to reality: low Earth Orbit satellites", October 2019.

51. Internet growth has been slowing − 51% of the global population connected in 2018. Could space-based internet help tick this growth up and support digital economy growth? (% increase in internet users)



Source: IITU

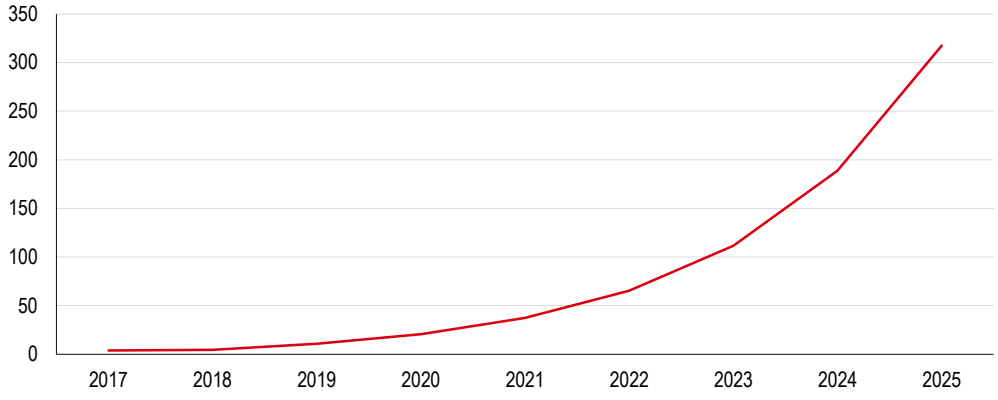
Data centre infrastructure set to grow and can even out globally

Digital economy means more data centres, especially in EM

As we outlined in the previous chapter, power consumption from the data revolution could rise from about 8% today to nearly 20% of global power by 2030 (see "Powering the data revolution", May 2019). Everything digital we talk about in this note, whether its online payments through apps or high definition immersive VR on goggles, travels through data centres. If connectivity is paramount, data centres are essential part of the tech stack.

Due to increasing data privacy concerns globally, the physical location of data centres becomes more important. We believe that regionalisation of data centres may take precedence and determine their locations going forward, we note that today most are located in the developed world. As more of the EM become connected, we're likely to see investment in data centres grow in these regions.

52. Expected cumulative VR/AR headsets in circulation by mid 2020s (millions)



Source: HSBC estimates, IDC, Statistica

The next reality – virtual reality

2020s is the decade of VR, with the number of applications and content set to grow

Over the last few decades, many things have pivoted online, from physical to digital or atoms to bytes. For example, physical letters to instant messages on apps like Facebook Messenger, physical FT newspaper to FT.com, encyclopaedia Britannica books to Wikipedia, physical CDs to Spotify streams, HMV to Netflix movies, physical travel agents to Kayak, Kodak photos to Instagram, ATMs to Revolut payments. We believe this is just the start. Next for virtualisation is *experience* itself, through immersive virtual reality goggles and then then VR Ray-Ban like lightweight glasses. The pandemic is accelerating this tech stack. See "Beyond reality: the show must go on – can VR content make money today?" (July 2020).

Even though the initial application for VR was for immersive gaming (as seen from the 5m units of PSVR being sold globally, reported by Sony, which makes it the biggest selling VR headset to date), today VR in general is beginning to make inroads for virtualising many other non-gaming experiences too through wireless headsets like the Oculus Quest. Applications we have observed include: social VR, working from home in VR, education, conferences, concerts and festivals (Burning Man 2020 is in VR this year), sports, theatre, museums, medicine and fitness – all without physical travel. VR has the potential to virtualise previous experiences where there was only an analogue counterpart and for which you had to physically travel. This can push more of the global GDP to digital − chart 52 shows the potential growth of VR/AR headsets over the coming few years.

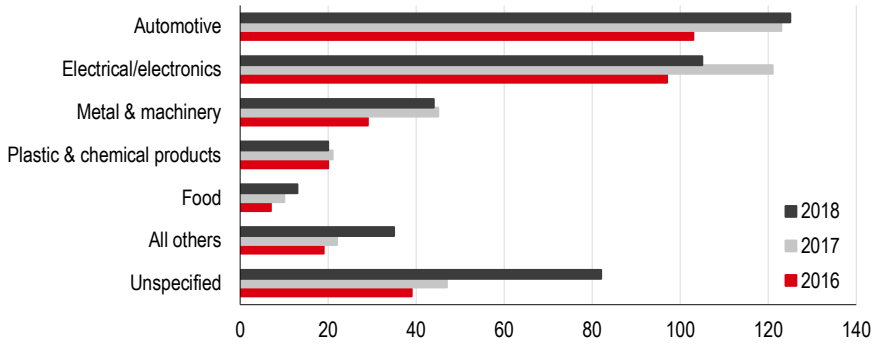
Automation to support the physical goods digital economy

AVs, drones and robotics with machine vision set to grow with the digital economy but put pressure on jobs

As we have discussed in this note, the pandemic has accelerated trends for buying things online and these shifts in digital habits could be lasting. If this is true, and online buying doubles by 2030, then society will need the corresponding physical infrastructure to support this digital consumption in physical goods. As we outlined in "Transport shock: autonomous today, virtual tomorrow" (October 2016), autonomous vehicles will be used to transport physical goods and VR to 'transport' people. We believe AI and machine vision powered technologies like robotics, autonomous vehicles (AVs) and drones will be growth areas. Chart 54 shows the various industries using robotics today. See "Global machine vision" (May 2020).

More logistics robotics (like in Amazon warehouses), AVs (Neolix delivered medical supplies and food to hospitals during the pandemic using AV pods, Amazon agreed to buy AV maker Zoox in June 2020) and drones (UK/US tested drones to deliver PPE this year) delivering our physical goods is a double edged sword. It will make possible to get goods to consumers faster and power consumerism but at the same time, this level of automation is likely to put pressure on lower income jobs. For example, the number of driving-related jobs in the US that could be at risk of automation account for roughly 4% (5.64m) of the workforce see "Autonomous vehicles – the AI road ahead", October 2017. The question is, can new work be created for these workers and if not can government support these workers through programmes like UBI or taxes?

53. Global annual industrial robot installations – can COVID-19 accelerate the trend for more automation in more sectors helping digitise the economy like food?

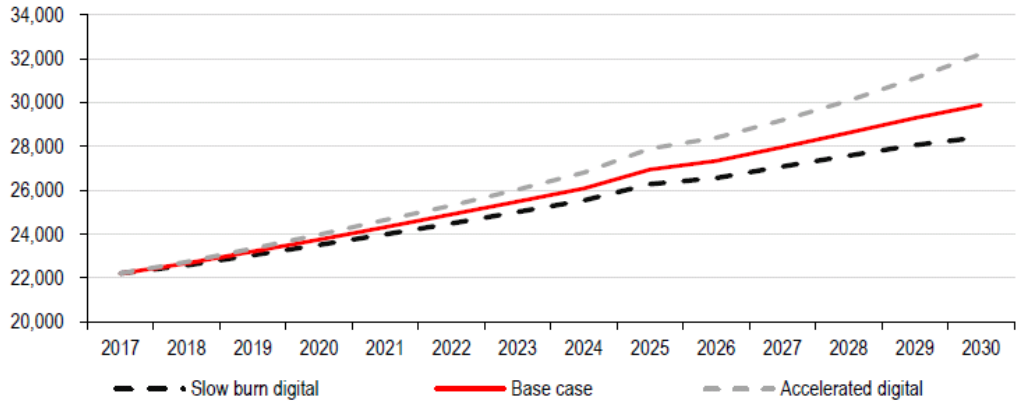


Source: International Federation of Robotics

Energy issues

Whilst we discuss the benefits of going digital for the economy, there are some possible ESG issues with digitisation which we believe are important to address today. Namely, the exponential growth of data expected over the coming decade could put pressure on power consumption. So far efficiency gains have offset higher data consumption but we believe the downside risk has not been given serious thought in general along the whole investment chain. If digital laws like Koomey's Law slows, it could mean that data growth could upend data efficiency gains. We have estimated that the data revolution could consume as much as 20% of global power by 2030. A push further into renewables for data centres could provide some relief but if the right scenarios are not being modelled today, then there might be an underbuild of this kind of infrastructure going forward. See our Industrials team report, "Powering the data revolution", May 2019 for more details.

54. Could digitisation become a larger user of global share of electricity and cause ESG issues for power demand?



Source: HSBC estimates, IEA

Further reading

HSBC reports on the digital economy

Macro

The disrupted economy: 10 key questions for the digital age, 4 February 2019

The rise of the digital natives: What demographic shifts mean for consumption, 12 September 2016

Upwardly mobile: Three themes driving EM growth, 9 October 2017

A world without cash?: The impact of the rise in electronic payments, 17 May 2017

No cash, please: Will COVID-19 accelerate the demise of paper money?, 29 April 2020

Leaving the city: How will life change if we commute less?, 28 May 2020

Technology/equities

Esports: Why Esports requires a different perspective, 28 May 2020

Beyond Reality: The show must go on – can VR content make money today?, 20 July 2020

Leapfrog tech 2.0: From Hype to Reality: Low Earth Orbit Networks, 3 October 2019

Spotlight: Powering the data revolution: The strains facing global electricity, 30 May 2019

Leapfrog technologies: How space-based tech can help EM, 9 October 2018

The Nomadic Investor: Unbundling the City: Beyond Urbanisation, 2 May 2017

Useful reading from elsewhere

UNCTAD: Digital economy report 2019: Value creation and capture: implications for developing countries, 4 September 2019.

OECD: Going Digital: Shaping Policies, Improving Lives, 11 March 2019

OECD: A roadmap toward a common framework for measuring the digital economy: Report for the G20 Digital Economy Task Force, 2020

OECD: Measuring the Digital Transformation: A Roadmap for the Future, 2019

International Labour Organisation (ILO) (2018), Digital labour platforms and the future of work: Towards decent work in the online world International Labour Office – Geneva, ILO, 2018

International Monetary Fund (IMF) (2018), Measuring the Digital Economy, IMF Policy Paper, April 2018

Notes

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Disclosure appendix

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From 23rd March 2015 HSBC has assigned ratings on the following basis:

The target price is based on the analyst's assessment of the stock's actual current value, although we expect it to take six to 12 months for the market price to reflect this. When the target price is more than 20% above the current share price, the stock will be classified as a Buy; when it is between 5% and 20% above the current share price, the stock may be classified as a Buy or a Hold; when it is between 5% below and 5% above the current share price, the stock will be classified as a Hold; when it is between 5% and 20% below the current share price, the stock may be classified as a Hold or a Reduce; and when it is more than 20% below the current share price, the stock will be classified as a Reduce.

Our ratings are re-calibrated against these bands at the time of any 'material change' (initiation or resumption of coverage, change in target price or estimates).

Upside/Downside is the percentage difference between the target price and the share price.

Prior to this date, HSBC's rating structure was applied on the following basis:

For each stock we set a required rate of return calculated from the cost of equity for that stock's domestic or, as appropriate, regional market established by our strategy team. The target price for a stock represented the value the analyst expected the stock to reach over our performance horizon. The performance horizon was 12 months. For a stock to be classified as Overweight, the potential return, which equals the percentage difference between the current share price and the target price, including the forecast dividend yield when indicated, had to exceed the required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). For a stock to be classified as Underweight, the stock was expected to underperform its required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). Stocks between these bands were classified as Neutral.

*A stock was classified as volatile if its historical volatility had exceeded 40%, if the stock had been listed for less than 12 months (unless it was in an industry or sector where volatility is low) or if the analyst expected significant volatility. However, stocks which we did not consider volatile may in fact also have behaved in such a way. Historical volatility was defined as the past month's average of the daily 365-day moving average volatilities. In order to avoid misleadingly frequent changes in rating, however, volatility had to move 2.5 percentage points past the 40% benchmark in either direction for a stock's status to change.

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Hold	36%	(33% of these provided with Investment Banking Services)
Sell	9%	(23% of these provided with Investment Banking Services)

For the purposes of the distribution above the following mapping structure is used during the transition from the previous to current rating models: under our previous model, Overweight = Buy, Neutral = Hold and Underweight = Sell; under our current model Buy = Buy, Hold = Hold and Reduce = Sell. For rating definitions under both models, please see "Stock ratings and basis for financial analysis" above.

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